PESTICIDES ABSTRACTS

August 1981 - Vol. 14, No. 8
Abstracts 81 - 2101-2400
PSTAB 14(08) 589-653 (1981)

U.S. ENVIRONMENTAL PROTECTION AGENCY

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PESTICIDES ABSTRACTS (formerly Health Aspects of Pesticides Abstracts Bulletin) is a monthly publication of the Management Support Division of the Office of Pesticides and Toxic Substances, Environmental Protection Agency.

The purpose of this publication is to foster current awareness of the major worldwide literature pertaining to the effects of pesticides as defined in the Table of Contents. The publication represents a monthly review of more than 2,000 primary and secondary sources. A list of periodicals from which articles have been abstracted appears annually in the January issue. Subjects and authors of abstracted articles are cross-referenced in quarterly and annual indexes. Reprint requests should be directed to the author of the complete article.

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81-2101. Mordaleva, L. G.; Maksimova. L. P. (All-Union Res. Tobacco Inst., Krasnodar, USSR) **Vliyanie gerbitsidov postuplenie elementov mineral'nogo pitaniya v tabachnoe rastenie. [Effect of herbicides on assimilation of mineral fertilizers by tobacco plants]** *Agrokhimiya* (2): 131-135; 1981 (5 references) (Russian).

The effects of the herbicides Treflan (trifluralin), Devrinol (napropamide), and Tillam (pebulate) on the accumulation of the elements of mineral nutrition were studied in tobacco plants. Experiments were conducted on different soil types and under different cultivation conditions. In unirrigated land, Treflan increased accumulation of phosphorus (P) and potassium (K) in stems and leaves but did not affect nitrogen (N) accumulation. In irrigated land, Treflan was conducive to N accumulation in the stems, but had negative effects on N-P-K accumulation in leaves. Similar results were recorded for Devrinol and Tillam. Changes in the N-P-K level had positive effects on the chemical composition of tobacco cultivated in unirrigated land. During irrigation, Devrinol and Tillam improved the yield of high quality tobacco, while Treflan caused a decline in the quality of tobacco yield.

81-2102. Schildnecht, H. (Org. Chem. Inst., Univ. Heidelberg, D-6900 Heidelberg, BRD) **Reiz- und Abwehrstoffe hoeherer Pflanzen - ein chemisches Herbarium. [Stimulants and protective substances produced by higher plants - a chemical herbarium.]** *Angew. Chem.* 93(2): 164-183; 1981 (190 references) (German).

Studies on stimulants and defensive substances produced and secreted by higher plants are reviewed. Certain plants, such as *Nicotiana* species, *Acacia melanogylon, Azadirachta indica,* and *Ajuga remota,* produce substances to fend off insects, which would otherwise destroy them. Certain plants, such as the balsam fir, produce juvenile hormones (juvabion) which controls development of harmful insects. The development of insects can also be inhibited by juvenile hormone antagonists, such as 4-methyl- and 6,7-dimethoxy-2,2-dimethylchromenes and precocenes produced by *Ageratum houstoneanum.* Certain plant substances, such as pyrethrins produced by *Chrysantheum cineriaefolium,* have been synthesized for use as insecticides. Plants are also able to produce substances which make them resistant to harmful factors, such as fungi and physical factors (phytoalexins).

81-2103. Costle, D. M. (US EPA, Washington, DC) **The spread of an idea: environmentalism on the international scene.** *Ann. Am. Acad. Pol. Soc. Sci.* 444: 121-127; 1979.

International environmental concerns are briefly reviewed. Topics discussed include chlorofluorocarbons, acid rain, environmental cooperation between the US and the USSR, health problems and the environment, energy, recognition that environmental resources are present in limited amounts, rapidly expanding populations and the damaging side effects of valuable technologies. In the discussion of health problems the use of DDT for malaria control, the development of mosquito resistance to DDT, and the present use of integrated pest management techniques are considered. The economic costs of cleanup efforts are compared to the substantially lower costs of proper environmental controls and disposal procedures; Love Canal, New York, PCB disposal in North Carolina, and Kepone (chlordecone) contamination of the James River in Hopewell, Virginia, are discussed as examples.

81-2104. Murphy, T. J. (DePaul Univ., Chicago, IL 60614) **Evaluation of a technique for measuring dry aerial deposition rates of DDT and PCB residues.** *Atmos. Environ.* 15(2): 206-207; 1981 (11 references).

A critical evaluation of a previously described technique for collecting dry aerial deposition (DAD) of chlorinated hydrocarbons (CHCs) is presented in this letter to the editor. The technique does not account for vapors and, therefore, the passive collector provides overestimates of DAD. No rationale is given for using mineral oil as the surface film; numerous arguments for various surface materials are considered. Mathematical proof is presented that leaving the collectors in place for 8 days is less efficient than replacing the collector daily for 8 days. Before the 8 day period is over the oil becomes saturated and no more vapors are scavanged, even though DAD could still be collected. Mathematical evidence for use of a polar collecting surface is also presented.

81-2105. Heesen, T. C.; Young, D. R. (S. California Coast. Water Res. Proj., Long Beach, CA 90806) **Evaluation of a technique for measuring dry aerial deposition rates of DDT and PCB residues.** *Atmos. Environ.* 15(2): 207-208; 1981.

In this reply to the previous letter to the editor, it is agreed that different surfaces would be expected to have different collection efficiencies and that surface polarities may also be important factors in collection of deposition data. However, the original data is referenced to indicate that dry aerial deposition measurement of chlorinated hydrocarbons by dry ice and oiled plate collection devices agree within 10%. It is therefore concluded that, while future improvements in trace organic analysis is desirable, the oiled plate collector provides reasonable reliable rate estimates of dry aerial deposition. It is also suggested that oiled surface collectors may be particularly advantageous in that they are similar to organic films on bodies of water.

81-2106. Oxley, T. A.; Becker, G., ed.; Allsopp, D., ed. (Biodeteriorat. Cent., Univ. Aston, Birmingham, England) **Biodeterioration. The Proceedings of the Fourth International Biodeterioration Symposium, Berlin.** *(Pitman Publ. Ltd.: London):* 375 pp.; 1980.

This symposium on biodeterioration covered a

wide range of topics including pulp paper and archival materials, biodegradation of fuels and lubricants, wood destroying organisms and their control, microbial degradation of metals, biodeterioration of polymers, rubbers and plastics, enzymatic effects, organisms and materials in the marine environment, biodeterioration of stored agricultural products, marine fouling organisms and antifouling materials, efficacy and biodegradation of biocides and antibiotics, and environmental and testing problems. Abstracts of papers from this symposium will appear in the appropriate sections of this issue of *Pesticides Abstracts.*

81-2107. Leveque, C.; Herbinet, P. (Hydrobiol. ORSTOM, F-75008 Paris, France) **Caracteres meristiques et biologie de Schilbe mystus (Pisces, Schilbeidae) en Cote D'ivoire. [Meristic characteristics and biology of *Schilbe mystus* (Pisces, Schilbeidae) in Ivory Coast.]** *Cah. ORSTOM Ser. Biol. Paris* 13(3-4): 161-170; 1980 (14 references) (French).

The meristic characters and biology of *Schilbe mystus* (Pisces, Schilbeidae) in Ivory Coast are described. The considerable decrease in the gill-net catches in 1974 was feared to be the consequence of the regular use of insecticides, especially Abate (temephos), along rivers to control onchocerciasis. The catches were, however, abundant again in 1979. The findings indicate that the variations observed in the abundance of this species were apparently the result of unfavorable hydrological conditions rather than of pesticide use.

81-2108. Anonymous **Pesticide makers try to get rid of nitrosamines.** *Chem. Eng. News* 59(15): 64; 1981.

It is reported that pesticide manufacturers are attempting to eliminate nitrosamines from pesticide formulations. Nitrosamines can be formed by the action of nitrosating agents on secondary amines during manufacture, or by the use of nitrite or nitrate to inhibit container corrosion. In order to prevent nitrosamine formation, aeration and scrubbing can be used to remove nitrosating agents from raw materials and intermediate nitration products. Although acid treatment can be used to destroy trace nitrosamines in finished products, total elimination cannot always be achieved.

81-2109. Singmaster, J. A., III (Author address not given) **TCDD in hexachlorophene.** *Chem. Eng. News* 59(18): 2, 58; 1981 (7 references).

An article which dealt with an analytical procedure for hexachlorophene residues, in which it was noted that some commercial hexachlorophene formulations are contaminated with TCDD, is cited as evidence that TCDD residues may commonly occur in hexachlorophene. This chemical is widely used, and epidemiology studies for TCDD effects due to hexachlorophene use are strongly recommended. No data on the frequency or quantity, nor any references to such data, were given in the original article. The US EPA indicates that the agricultural fungicide-bactericide hexachlorophene should contain < 0.1 ppm TCDD as contaminant. These findings are taken as an indication that the presence of TCDD as a contaminant in hexachlorophene has been known for some time. Besides direct antiseptic exposures, agricultural fungicide applicators and hexachlorophene plant workers are identified as 2 groups that may have had possible chronic exposures to TCDD. Present EPA registrations for the use of hexachlorophene in tomatoes, peppers, and cucumbers limit harvest to 3 to 5 days after application, but no residue limit is given for harvested crops.

81-2110. de Serres, F. J., ed.; Hollaender, A., ed. (NIEHS, Res. Triangle Park, NC) ***Chemical Mutagens. Principles and Methods for Their Detection.*** *(Plenum Press: NY):* 6: 485 pp.; 1980.

In this volume of *Chemical Mutagens,* a systematic listing of the chemicals that have been tested for mutagenic activity is provided as a convenient reference to tabulated test data with particular assay systems. In the area of modifications of mutagenic activity, discussions are presented on factors that alter *in vitro* metabolic activation, the role of genetic heterogeneity, and the need for a better understanding of mutation-induction kinetics and the mathematical analysis providing an important step in this direction. A new approach for the induction of specific locus mutations in human cells in culture is also described. Problems in the practical application of various short-term tests encountered in commercial testing laboratories are evaluated. Abstracts of individual chapters from this book will appear in the appropriate sections of this issue of *Pesticides Abstracts.*

81-2111. Petkov, S. T.; Dryanovska, O. A. (Inst. Genet., Bulgarian Acad. Sci., Sofia, Bulgaria) **Cytogenetic effect of the herbicides 2,4-D and basagran in *Pisum sativum.*** *Dokl. Bolg. Akad. Nauk* 33(9): 1255-1257; 1980 (8 references).

Plants were sprayed with 2,4-D and Basagran (bentazon) at the phase of the fourth leaf. Concentrations of 2,4-D used were 40 and 80 g in 30 *l* water/decare. Concentrations of basagran were 100 and 150 ml in 30 *l* water/decare. For the investigation of the first mitosis the root tips were taken at 9, 12, 15, and 18 hr after treatment. The highest percentage of mitoses was noted at 12 hr. The mitotic indices for 9 and 15 hr were almost the same for controls and for Basagran treated plants. For 2,4-D a stimulating effect was noted at 9 hr and an inhibiting effect at 15 hr. Several days after spraying with the two herbicides, particularly with the higher concentrations, there appeared to be epinastic distortions of the stems and leaves

and, in some cases, changes in the form of the leaves. Later the plants appeared restored without apparent long term injury.

81-2112. Crossland, J. (Author address not given) **Dioxin: the lingering controversy.** *Ecologist* 10(3): 87-93; 1980 (30 references).

Dioxin, the unavoidable contaminant in the production of 2,4,5-T, is one of the most toxic substances known. Current controversy about dioxin concerns its possible accumulation in the environment and symptoms of ill health reported by thousands of Vietnam War veterans which are claimed to be a result of exposure to dioxin from Agent Orange, a 2,4,5-T containing defoliant employed during the Vietnam War. A sublethal dose of dioxin can cause damage in various body tissues. Rats, mice and guinea pigs have demonstrated decreases in thymus gland wt, a decline in thymocyte production, and degeneration and necrotic changes in liver cells with hemorrhaging in the gastrointestinal tract, heart, and brain. Anemic and internal hemorrhaging were noted in monkeys after long-term exposure to dioxin at 500 ppt. Monkeys receiving a total body burden of 2 to 3 μg dioxin/kg body wt over a 9 mo period died. Human exposures have been suggested to be linked to spontaneous abortions. Possible food chain concentration of dioxin is also considered.

81-2113. Krummel, J. (Coll. Agric. & Life Sci., Cornell Univ., Ithaca, NY 14853) **The economic consequences of abandoning pesticide use.** *Ecologist* 10(3): 98-101; 1980.

A benefits analysis of pesticide use is presented. Considerable direct dollar benefits are derived from the use of pesticides; returns on a dollar of $3-5 have been reported. The actual percentage of crop acreage treated with pesticides is considered small; insecticides are used on ~18%, herbicides on ~56% and fungicides on ~2% of the total crop acreage. Major, large acreage crops account for the majority of all pesticide use. Nonchemical pest control methods are also reviewed. Nonchemical controls are widely used on certain large acreage crops such as corn. Crop rotation and resistance of certain crops are important nonchemical methods of combating pests. Weeds are still controlled on most crop acreage by tillage, cultural practices, and sometimes by combination of these with herbicides. The major means of plant disease control is nonchemical and includes the use of resistant varieties and cultural manipulations. There is no indication that major food shortages would occur in the United States if pesticide use was stopped; however, there might be serious shortages of specific fruits and vegetables, including apples, peaches, onions and tomatoes, if pesticides were no longer employed.

81-2114. Yodaiken, R. E. (Cent. Dis. Control., NIOSH, Rockville, MD) **The role of the pathologist in environmental and occupational disease.** *Hum. Pathol.* 12(4): 297-299; 1981 (13 references).

Pathologists are involved in efforts to decrease the hazards in the workplace environment and the ambient environment, by detecting and reporting the health effects and finally determining the extent of any problems which exist. Three principal methods exist for detecting, limiting, and controlling environmental hazards. The first technique calls for controlling the source before the contaminants escape. The second technique is to monitor places where toxins are likely to be concentrated. A third preventive measure is animal experimentation with suspected chemical and physical agents. The need to create physician awareness of possible occupational hazards remaining a great one. Similar efforts are still needed among firm management. Pathologists seek to obtain occupational and environmental work histories, to actively determine etiologies of cancer and chronic disease, and other factors of importance to the individual case and to the public at large can be helped by the cooperation of the firm.

81-2115. Gupta, R. C.; Gupta, P. K. (Ind. Toxicol. Res. Cent., Lucknow 226001, India) **Phytotoxic effects of endosulfan on green gram *Vigna radiata* (Linn.) Wilezek.** *Indian J. Biochem. Biophys.* 17(4): 20; 1980.

Endosulfan (0.035-0.3%) was applied to seeds of green gram, *Vigna radiata* L. Wilezek (*Phaseolus aureus* Roxb.) and percent germination, growth, pollen production, pollen viability and pollen tube growth were evaluated. No toxic effects were observed at the 0.035 and 0.07% treatment levels, but at 0.15 and 0.3%, coiling of the radicle, inhibition of root growth, stunting of shoots and burning of tips and leaf margins were observed. Endosulfan-affected plants were dwarf and chlorotic with damaged pollen grains and low productivity. These effects suggest impairment of physiological functions of plant cells by higher levels of endosulfan which may lead to low productivity. [Presented at the 1979 annual meeting of Indian biochemists.]

81-2116. Singh, G.; Mishra, D. P.; Agrawal, A. K. (Dep. Biochem., G. B. Pant Univ., Pantnagar 263145, India) **Phospholipids of maize chloroplasts: effect of aging & herbicides.** *Indian J. Biochem. Biophys.* 17(4): 20; 1980.

The effects of aging, simazine and metoxuron on total lipids, total phospholipids, phosphatidyl-glycerol (PG), phosphatidylinositol (PI) and phosphatidylcholine (PC) of *Zea mays* chloroplasts were investigated. All of the lipids showed marked changes in chloroplast development at different stages of growth. Simazine had no effect on any of the parameters studied while metoxuron treatment significantly decreased the content of all the lipids and increased PC significantly at all stages of growth. Metoxuron had no significant effect on PG. [Presented at the 1979 annual meeting of Indian biochemists.]

81-2117. Agarwal, S.; Beg, M. U.; Krishna Murti, C. R. (Ind. Toxicol. Res. Cent., Lucknow 226001, India) **Biochemical changes associated with retarded *C. arietinum* seedling growth due to endosulfan.** *Indian J. Biochem. Biophys.* 17(4): 21; 1980.

The biochemical mechanisms of endosulfan-induced retardance of root and shoot growth of *C. arietinum* were examined. In cotyledons, free sugars were rapidly released from storage in polymeric forms, but on days 3 to 7 of germination, the free sugar levels remained unaltered. Starch levels in cotyledons of exposed seeds were depleted more rapidly after pesticide exposure but subsequently declined and fell below that of controls. Amylase activity of exposed seeds followed the same pattern during germination. In seedlings, the accumulation of free sugars showed their delinked incorporation in various synthetic reactions upon exposure to endosulfan. These effects may ultimately lead to the inhibition of growth observed in seedlings exposed to endosulfan. [Presented at the 1979 annual meeting of Indian biochemists.]

81-2118. Sengupta, P. K.; Roy, S.; Dastidar, S. G.; Ghosh, J. J. (Dep. Biochem., Univ. Coll. Sci., Calcutta 700019, India) **Effect of malathion exposure on the cellulases of germinating wheat & maize.** *Indian J. Biochem. Biophys.* 17(4): 22-23; 1980.

The effects of malathion on the dynamic role of cellulases in roots of germinating wheat and maize were examined. In normal (untreated) seeds, total cellulase activity (both buffer-soluble and buffer insoluble) is significantly increased on the fifth day after germination. In malathion treated seeds the corresponding values of cellulase activity are significantly affected. These findings suggest that organophosphorus pesticides may alter the carbohydrate dynamics of germinating wheat and maize seedlings. [Presented at the 1979 annual meeting of Indian biochemists.]

81-2119. Agrawal, A. K.; Mishra, D. P.; Singh, G. (Dep. Biochem., G. B. Pant Univ., Pantnagar 263145, India) **Effect of aging & herbicides on galactolipids of maize chloroplasts.** *Indian J. Biochem. Biophys.* 17(4): 92; 1980.

Chloroplasts isolated from control and herbicide-treated maize (*Zea mays*) plants showed parallel changes in total lipids, total galactolipids, MGDG, and DGDG contents 5-25 days after emergence. Marked variations in the composition of lipid chloroplasts were observed which were dependent upon chloroplast development. The MGDG/DGDG ratios reached a maximum of 1.997:1 on the 10th day, whereafter they declined steadily to a low of 1.608:1 by the 25th day due to a preferential loss of MGDG in the chloroplasts. The similar results observed in untreated and simazine-treated maize were attributed to the high tolerance of maize for simazine. On the other hand, treatment of maize plants with metoxuron caused a significant reduction in total lipids, total galactolipids, MGDG and DGDG content and MGDG/DGDG ratios in the chloroplasts. [Presented at the 1979 annual meeting of Indian biochemists.]

81-2120. Jain, R. K.; Maherchandani, M.; Sharma, D. R.; Chowdhury, V. K. (Dep. Genet., Haryana Agric. Univ., Hissar 125004, India) **Effect of gamma-radiations & growth regulators on isoperoxidases in haploid cultured cells of *Datura innoxia*.** *Indian J. Biochem. Biophys.* 17(4): 93; 1980.

The interaction of γ-radiation and growth hormones on the enzyme activity and isoenzyme pattern of peroxidase was studied in haploid cultures of *Datura innoxia* cells. Peroxidase activity was enhanced by 0.2 and 1 kR, but decreased by a 5 kR dose of γ-radiation. Growth hormones IAA and GA_3 produced similar stimulatory effects. Three groups of isoperoxidases were classified by polyacrylamide gel electrophoresis. A fast moving group of isoperoxidases were observed in the presence of IAA and low doses of radiation, while a slow moving isoenzyme was identified in irradiated cells grown on 2,4-D medium. [Presented at the 1979 annual meeting of Indian biochemists.]

81-2121. Chakraborty, S.; Das, K. K.; Dastidar, S. G.; Banerjee, S. K. (Dep. Biochem., Calcutta Univ., Calcutta 700019, India) **Effect of malathion on mitochondrial protein synthesis of *V. sinensis* (L) Savi.** *Indian J. Biochem. Biophys.* 17(4): 106; 1980.

Treatment of *Vigna sinensis* L. seeds with malathion (50 ppm) produced stimulation of ^{14}C-labeled phenylalanine incorporation into protein. Mitochondrial protein synthesis was markedly inhibited (about 50% decrease) when seeds were treated with 400 ppm malathion. Similar trends were observed using ^{14}C-leucine and ^{14}C-valine as the radioactive precursors. Research is being conducted on the augmentation of amino acid incorporation by plant growth promoters IAA, GA_3, and kinetin. [Presented at the 1979 annual meeting of Indian biochemists.]

81-2122. Miller, I. R.; Bajaj, K. J. (Dep. Biochem., Punjab Agric. Univ., Ludhiana 141004, India) **Comparative effect of some hydroxybiphenyls on hepatic drug metabolising enzyme activities in rat.** *Indian J. Biochem. Biophys.* 17(4): 108; 1980.

The effects of position and degree of substitution of the biphenyl nucleus with hydroxy groups on the activities of aniline hydroxylase and aminopyrine *N*-demethylase were examined in rats. Hepatic drug enzymes were induced by resubstituting the biphenyl nucleus as well as the four hydroxybiphenyls tested. The most pro-

nounced effects were observed in rats injected with 2-hydroxybiphenyl and 2,2'-dihydroxybiphenyl, suggesting that the position of the hydroxyl group on the biphenyl nucleus had a stronger influence on enzyme activity than did the number of hydroxy groups present. [Presented at the 1979 annual meeting of Indian biochemists.]

81-2123. Bhatnagar, R. S., ed. (Sch. Dent., Univ. California, San Francisco, CA) ***Molecular Basis of Environmental Toxicity.*** Ann Arbor Sci. Publ. Inc.: Ann Arbor, MI): 589 pp.; 1980.

In this book the determination of biological effects of specific agents as well as of broad classes of compounds now present in, or which are likely to be introduced into, the environment is considered. Information about the molecular mechanisms involved in environmentally induced health effects is useful for prediction of the potential toxicity of substances with known chemical characteristics. This type of information would eventually be used in formulating regulatory guidelines. The book is divided into six sections which discuss free radical mechanisms, mechanisms of cellular injury, molecular mechanisms in environmental carcinogenesis, metal-tissue interactions, environmental effects on macromolecular structure and problems in correlating molecular mechanisms with environmental toxicity.

81-2124. Anonymous **Chemical care.** *Occup. Saf. Health* 11(4): 46; 1981 (3 references).

Precautions which should be taken regarding the use of agricultural chemicals, including pesticides, are outlined. All such chemicals should be kept in dry, ventilated, well-lit lockable storage areas, away from produce, fodder, and livestock. Appropriate protective clothing is essential and should be stored in ventilated areas when not in use. Manufacturers' instructions should be followed carefully, and particular attention should be payed to mixing of chemicals, since pesticides have been rendered ineffective and equipment ruined when incompatible products have been mixed. Face shields are important to prevent burns to eyes and face.

81-2125. Moreland, D. E. (Agric. Res., SEA, USDA, Raleigh, NC 27650) **Interaction of perfluidone with mitochondrial, thylakoid, and liposome membranes.** *Pestic. Biochem. Physiol.* 15(1): 21-31; 1981 (23 references).

Mitochondria were prepared from 3-day-old dark-grown mung bean hypocotyls. Intact chloroplasts were isolated from freshly harvested greenhouse or growth chamber-grown spinach. The effects of perfluidone were measured on three photo-induced partial reactions. Swelling was measured spectrophotometrically. Liposomes were prepared from crude soybean phosphatidylcholine. Perfluidone interfered with phosphorylation and electron transport in the mung bean. In spinach thylakoids perfluidone also acted as a uncoupler at low concentrations. Perfluidone inhibited the rate and magnitude of valinomycin-induced mitochondrial swelling in isotonic potassium chloride and potassium thiocyanate as well as when the thylakoids were suspended in potassium thiocyanate at concentrations that inhibited ATP generation. The permeability of lecithin liposomes to protons was increased by perfluidone. These results suggest that partitioning of perfluidone perturbs the inner mitochondrial and thylakoid membranes. The ATP-generating pathway in both mitochondria and chloroplasts is uncoupled and the structural organization of the electron transport components is disrupted in the mitochondria, causing multisite inhibition of respiration. A direct interaction between perfluidone and redox components of the electron transport pathways was not observed.

81-2126. Toia, R. E., Jr.; Christ, D. K.; Poole, R. E.; Bent, P. E.; Peters, G. A. (Charles F. Kettering Res. Lab., Yellow Springs, OH 45387) **Effects of selected pesticides on physiology and composition of four *Azolla* species.** *Plant Physiol.* 67(4): 81; 1981.

Three herbicides were examined for their effects on 4 *Azolla* species: *A. caroliniana* Willd., *A. filiculoides* Lam., *A. mexicana* Presl. and *A. pinnata* R. Br. The herbicides tested were propanil, 2,4-D and butachlor. Three insecticides, cartap hydrochloride, carbofuran and bendiocarb, were also tested. No significant species specific differences in rates of growth, nitrogen fixation, carbon dioxide exchange in light and dark, percentage of dry matter, percentage of carbon, or percentage of nitrogen or chlorophyll content were noted in response to any of the pesticides after 1 or 2 wk of exposure. Propanil and butachlor at 1.0 ppm; 2,4-D, cartap hydrochloride and bendiocarb at 100.0 ppm; and carbofuran at 500.0 ppm in the nutrient solutions completely inhibited growth of each species.

81-2127. Semakov, V. V. (Lab. Microbiol. & Pathol. Rodents & Insects, All-Union Res. Inst. Agric. Microbiol., Leningrad, USSR) **Mikrobnye preparaty v bor'be s myshevidnymi gryzunami. [Use of microbial preparations for rodent control.]** *Priroda (Sofia)* (3): 81-85; 1981 (Bulgarian).

The use of microbial preparations for rodent control is discussed. Microbial preparations can be used not only as rodenticides but also as repellents. The antibiotics Actidion and Naramycin produced by *Streptomyces griseus* were effective in concentrations of 0.01-0.005%. Of 259 actinomyces tested, 23 were found to have repellent activity. Exogenous and endogenous metabolites of microscopic algae were also shown to have repellent activity against rodents.

81-2128. Hance, B. J. (Agric. Res. Council, Weed Res. Organ., Yarnton, Oxford OX5 1PE, England) **Effects of pesticides on plant nutrition.** *Residue Rev.* 78: 14-41; 1981 (173 references).

The effects of pesticides on plant nutrition are presented for corn, small grains, other cereals, legumes, cotton, potato, sugar cane, tomato, fruit crops and forest trees. A total of 76 herbicides, insecticides, fungicides and nematicides are mentioned. The concept that each plant species has a particular nutrient level for normal growth and that any change from normality results in changes in uptake is supported by much of the work reviewed. Unfortunately, some of the results are difficult to interpret because of incomplete knowledge of the relationship between the mineral content of a crop plant and the harvested yield. In addition, many studies have used either combinations of plants and pesticides that would not be usual in practice or unrealistically high rates of pesticide application. (Author abstract by permission, modified)

81-2129. Tweedy, B. G. (Biochem. Dep., Ciba-Geigy Corp., Greensboro, NC 27409) **Inorganic sulfur as a fungicide.** *Residue Rev.* 78: 43-68; 1981 (100 references).

Elemental sulfur is the oldest of all pesticides and even today, in an era of new chemistry and systemic action, sulfur remains the number one fungicide in terms of total pounds used. It remains effective for the control of a broad spectrum of diseases, has little or no detrimental effect to humans and their environment, and has a very low cost. It is classified as a nontoxic pesticide, thus neither tolerances nor analytical methods are necessary. Sulfur is mined from natural sulfur deposits and is also a by-product of several industries. It is formulated as dusts, wettable powders, and as a paste. The polysulfide forms of sulfur (lime sulfur) can be phytotoxic to some sulfur-sensitive plant selections, particularly at temperatures above 34°C. Several theories have been developed with regard to the fungitoxic effect of sulfur. These are reviewed in this paper. One way which sulfur expresses its toxic effect to fungi is by accepting electrons from the electron transport system, thereby disrupting the normal transfer of energy by the formation of ATP from ADP. Sulfur is also an effective miticide but its mechanism of action as a miticide is still not completely defined. (Author abstract by permission)

81-2130. Bock, R. (Hoechst AG, CH-1814 La Tour de Peilz, Switzerland) **Triphenyltin compounds and their degradation products.** *Residue Rev.* 79: 1-262; 1981 (838 references).

The phenyltin compounds, tetraphenyltin, phenyltin halogenides, phenyltin hydroxides and oxides, triphenyltin acetate, triphenyltin compounds of phosphoric and thiophosphoric acids, *bis*-triphenyltin sulfide, and radioactively labeled phenyltin compounds, are extensively reviewed. Chemical and physical behavior of the compounds is considered including acid-base reactions, hydrolysis and decomposition with benzene formation, complex formation, oxidation and reduction, electrochemical behavior, solubilities, thermal behavior, spectra, and photolysis through visible light and ultraviolet radiation. The pharmacology and toxicology of phenyltin compounds, including behavior in warm-blooded animals, is discussed with emphasis on acute toxicities, chronic toxicity of triphenyltin compounds, absorption, accumulation, distribution, secretion, and metabolism. Biological properties of triphenyltin compounds include their usefulness in the control of microorganisms, control of freshwater snails and sea organisms, effects on insects, control of mites, and control of rodents. The residues of triphenyltin compounds in or on plants and the behavior of these residues during food processing, including information on tolerances and waiting periods, are considered. Persistence of the compounds on the plants, in soil, in water, and their effects on game and useful insects are discussed.

81-2131. Holden, C. (Author address not given) **UCLA designing big Agent Orange stuúy.** *Science* 212(4497): 905; 1981.

A protocol to study the effects of Agent Orange (2,4,5-T + 2,4-D) and other phenoxy herbicides on Vietnam veterans will be designed by the University of California at Los Angeles with an award of $114,288 from the Veterans Administration. It is predicted that the protocol will call for tracing the histories of a cohort of men from the time they left the service to the present. Special attention would be paid to the reproductive system, central nervous system, kidneys, and liver and to the incidence of soft tissue sarcomas among the cohort. A major and insurmountable problem is that there is no way to determine who has been exposed to the herbicide. The Air Force is also conducting a $35 million study designed to reveal possible ill effects to the 1198 men engaged in spraying Agent Orange.

81-2132. Lezhava, G. G. (Min. Public Health Georgian SSR, Tbilisi, USSR) **Sostoyanie i perspektivy razvitiya issledovanii v oblasti gigieny okruzhayushchei sredy v Gruzinskoi SSR. [Research on environmental hygiene in the Georgian SSR.]** *Vestn. Akad. Med. Nauk SSSR* (3): 10-13; 1981 (Russian).

The results of research on medical aspects of environmental protection conducted in Georgia (USSR) are reviewed. Studies on the effects of phenol compounds, carbamates, phthalene, Sevin (carbaryl) and captan were used as the basis for hygienic regulation of these compounds in the environment. The results obtained were adopted by the World Health Organization. Extensive studies were conducted in the field of hygienic regulation of pesticides in bodies of water and food products. Research on malaria prevention allowed replacement of such toxic insecticides

as DDT and HCCH (BHC) by less ecologically harmful compounds.

81-2133. Duke, S. O.; Hoagland, R. E. (South. Weed Sci. Lab., Agric. Res., SEA, USDA, Stoneville, MS 38776) **Effect of glyphosate on the metabolism of phenolic compounds: VII. Root-fed amino acids and glyphosate toxicity in soybean (*Glycine max*) seedlings.** *Weed Sci.* 29(3): 297-302; 1981 (35 references).

Several regimes of supplying exogenous aromatic amino acids to intact, 3-day-old, soybean [*Glycine max* (L.) Merr. Hill] seedlings by root uptake were tested to determine if growth retardation caused by root-fed, 0.5 m*M* glyphosate [*N*-phosphonomethyl) glycine] could be reversed. Generally, root-fed levels of aromatic amino acids just below growth-retarding levels (e.g. 1 m*M* phenylalanine + 0.1 m*M* tyroxine) reversed root growth inhibition caused by glyphosate to a small (ca. 10%) but significant extent. Feeding aromatic amino acids for 1 to 3 days before glyphosate exposure did not enhance the reversal. Uptake and metabolism of root-fed, aromatic amino acids in control and glyphosate-treated plants were verified by increased levels of hydroxyphenolic compounds (end products of aromatic amino acid metabolism) and by uptake and incorporation of ^{14}C-labeled phenylalanine and tyrosine. On a fresh wt basis, glyphosate had no inhibitory effect on uptake or incorporation of these amino acids into protein or secondary phenolic compounds. After 3 days of exposure, glyphosate had no substantial effects on shikimate dehydrogenase activity in control or aromatic amino acid-fed seedlings. These data suggest that either root-fed aromatic amino acids are compartmentalized differently than the endogenous pools affected by glyphosate or that root-fed glyphosate exerts most of its effect on growth of soybean seedlings through means other than inhibition of aromatic amino acid synthesis. (Author abstract by permission)

81-2134. Ahrens, W. H.; Arntzen, C. J.; Stoller, E. W. (Agric. Res., SEA, USDA, Univ. Illinois, Urbana, IL 61801) **Chlorophyll fluorescence assay for the determination of triazine resistance.** *Weed Sci.* 29(3): 316-322; 1981 (24 references).

A procedure is described for the rapid analysis of leaf samples to determine triazine resistance. The technique uses a commercially available fluorometer and is based upon the fact that photosynthesis-inhibiting herbicides increase chlorophyll fluorescence (because of dissipation of absorbed radiant energy in the absence of useful photochemistry). Resistant and susceptible biotypes of 6 weed species were assayed. Fluorescence of susceptible leaf sections increased dramatically over a 1 to 3 hr exposure to atrazine [2-chloro-4-(ethylamino) -6-(isopropylamino) -*s*-triazine], but resistant leaf sections showed no fluorescence increase. Substantial fluorescence increases of both resistant and susceptible leaf sections were induced by diuron [3-(3,4-dichlorophenyl) -1,1-dimethylurea]. In the absence of herbicides, fluorescence was higher in resistant than in susceptible leaf sections, suggesting that the resistant biotypes are less efficient photosynthetically. Fluorescence analysis was used to characterize atrazine inhibition of photosynthesis in leaf sections of 3 crop species. Differences in atrazine-induced fluorescence between crop lines were relatively small and were not well correlated with atrazine tolerance. The fluorometer is a convenient device for monitoring photosynthesis inhibition, however, and could be useful in detecting plants having resistance to photosynthesis-inhibiting herbicides. (Author abstract by permission)

81-2135. Victoria, A. M.; Tezna, J. A.; Zuluaga, C. I. (Univ. Nac. Columbia, Palmira, Columbia) **Consideraciones de la actividad fungicida, aspectos metodologicos y deteccion de la residualidad de captafol en la pulpa de cafe. [Considerations on fungicidal activity, aspects of methods and detection of residues of captafol in coffee pulp.]** *Acta Agron. (Palmira)* 28(1-4): 129-143; 1979 (16 references) (Spanish).

Three hundred 35-mo-old coffee trees (*Coffee arabica*, var. Caturra) were sprayed with captafol (Difolatan 80%, 2.5 g/l, total spray volume 60 *l*). Mature coffee beans were collected at random 1-25 days after a single spraying, pulped, and subjected to residue determination by thin-layer chromatographic analysis. Residues of captafol were found for up to 22 days after treatment. No residues were found in beans gathered on day 25. It is suggested that the disappearance of residues between days 22 and 25 may have been due to precipitation (61 mm).

81-2136. Savage, E. P.; Keefe, T. J.; Tessari, J. D.; Wheeler, H. W.; Applehans, F. M.; Goes, E. A.; Ford, S. A. (Colorado Epidemiol. Pestic. Stud. Cent., Colorado State Univ., Fort Collins, CO 80523) **National study of chlorinated hydrocarbon insecticide residues in human milk, USA. I. Geographic distribution of dieldrin, heptachlor, heptachlor epoxide, chlordane, oxychlordane, and mirex.** *Am. J. Epidemiol.* 113(4): 413-422; 1981 (29 references).

Samples of human milk were obtained from 1436 women living in the United States and the milk samples were then analyzed by gas-liquid chromatography for chlorinated hydrocarbon insecticides. Dieldrin was found in over 80% of the samples tested. Chlordane was not found in any, however, oxychlordane, a metabolite of chlordane, was found in 74% of the samples tested. Heptachlor was found in less than 2%, but heptachlor epoxide, its metabolite, was found in 63% of the samples. Mirex was not found in any sample. The proportion of samples with dieldrin, heptachlor epoxide and oxychlordane concentrations above the detection limits of the method varied according to geographical locations within the United States. Nursing mothers from the northwest had the lowest mean levels of all 3 compounds. Women living in the Southwest had second highest levels of oxychlordane and dieldrin, while women from the Midwest excreted the second largest levels of heptachlor epoxide. Women from the Southeast had the highest mean levels of dieldrin, heptachlor epoxide and oxychlordane.

81-2137. Liu, D.; Fox, M. E. (Natl. Water Res. Cent., Burlington, Ontario, Canada) **Biodegradation of TFM in a cyclone fermentor system.** In: *Biodeterioration*. Oxley, T. A., Becker, G. and Allsopp, D., eds. (Pitman Publ. Ltd.: London): pp. 315-319; 1980 (11 references).

The use of a modified glass cyclone fermentor to investigate the relative biodegradation rate of the lampricide 3-trifluoromethyl-4-nitrophenol (TFM) under different laboratory environmental conditions was investigated. The cyclone fermentor comprised 3 main components: a cyclone column, a circulating pump, and a recirculation condenser. These formed a loop around which the culture circulated. A 1% stock solution of TFM was prepared and added to bring the contents of the fermentor system up to 15 mg/l TFM. Under aerobic conditions TFM remained essentially unchanged despite the fact that an abundance of microbial growth was noted in the co-metabolite fermentor. TFM effectively blocked the respiratory chain reactions of the aerobic microorganisms and thus prevented any degrading action. Under anaerobic conditions TFM rapidly biodegraded to 3-trifluoromethyl-4-aminophenol (RTFM); 90% was degraded in 30 days when glucose was the co-metabolite. Without glucose biodegradation was slowed to 89% in 46 days. Experimentation was done to demonstrate that TFM actually was biodegraded and not tied up with the cell matter, as TFM can be absorbed on sediment.

81-2138. Ross, P. F.; Osheim, D. L.; Nelson, H. A. (Toxicol. Sect., Pathobiol. Lab., Natl. Vet. Serv. Lab., Ames, IA 50010) **PCB residues in feedlot steers.** *Bull. Environ. Contam. Toxicol.* 26(4): 485-488; 1981 (4 references).

Tailhead fat biopsies were collected from feedlot steers after 5 mo exposure to PCBs in transformer oil used as an insecticide carrier in a backrubber. PCB concentration in fat samples ranged from 70-2200 ppm, with an average of 470 ppm. The extremely high levels of PCB present in the samples allowed a relatively simple extraction procedure to be used. Without exception all 113 biopsy samples had identical chromatographic profiles, with only small differences in relative amounts of each peak. Chromatograms of unexposed beef fat extracts showed no detector response in the region where the PCBs eluted.

81-2139. Kilikidis, S. D.; Psomas, J. E.; Kamarianos, A. P.; Panetsos, A. G. (Dep. Food Hyg., Fac. Vet. Med., Aristotelian Univ., Thessaloniki, Greece) **Monitoring of DDT, PCBs, and other organochlorine compounds in marine organisms from the North Aegean Sea.** *Bull. Environ. Contam. Toxicol.* 26(4): 496-501; 1981 (12 references).

Samples were taken on the north coast of the Aegean Sea industrial and agricultural areas. The major areas sampled corresponded to an anomalous coastline formed by the deltas of the 6 main rivers, the Aliakmon, Loudias, Axios, Gallikos, Strymon and Nestos. These are the main sources of pesticide and PCB contamination of the north Greece coast. A total of 142 samples of fish and shellfish were collected. No peak corresponding to *o,p'*-DDT, dieldrin or heptachlor was observed in any

sample. All samples had concentrations of aldrin lower than the detection limit of 0.01 ng. All samples contained PCBs and DDE. No significant differences were found in the distribution of total organochlorines in the organisms investigated, except for PCBs, which were more prevalent in *Mytilus barbatus* from the Strymonkos Gulf. Data from diverse geographic locations do indicate, however, a relative uniformity in total DDT residues in widely separated marine habitats. From these results it was noted that the north Aegean Sea is characterized by high levels of PCBs (340 ppb wet wt in *Mytilus galloprovincialis*), while the levels of ΣDDT in the same organisms is low (14 ppb wet wt).

81-2140. Chapman, R. A.; Tu, C. M.; Harris, C. R.; Cole, C. (Res. Centr., Agric. Canada, London, Ontario N6A 5B7, Canada) **Persistence of five pyrethroid insecticides in sterile and natural, mineral and organic soil.** *Bull. Environ. Contam. Toxicol.* 26(4): 513-519; 1981 (30 references).

Soils were subjected to insecticide treatment, incubation and microbial population determinations. Maximum soil pH ranges observed over the course of the experiment were as follows: natural mineral 8.0-8.1; sterilized mineral 7.7-8.1; natural organic 7.1-7.2; and sterilized organic 6.5-6.9. All of the tested insecticides degraded more slowly in the sterilized than in the natural soils, indicating that heat labile agents such as microorganisms are more important than purely physical or chemical processes in the disappearance of these materials. The *cis:trans* ratio for residual permethrin in both the mineral and organic soil did not change continuously or to the extent that had been noted in earlier studies. Decamethrin and fenvalerate were the least susceptible insecticides, particularly in organic soil. Permethrin and cypermethrin both degraded much more rapidly. Fenpropanate was degraded most rapidly. It was concluded that heat labile factors, assumed to be microorganisms, play a major role in the degradation of pyrethroid insecticides in soil. Degradation rates depend in part on structure, but also on undetermined variables. Both oxidative and hydrolytic processes are probably operative.

81-2141. Draper, W. M.; Street, J. C. (Anim. Dairy & Vet. Sci. Dep., Utah State Univ., Logan, UT 84322) **Drift from a commercial, aerial application of methyl and ethyl parathion: an estimation of potential human exposure.** *Bull. Environ. Contam. Toxicol.* 26(4): 530-536; 1981 (5 references).

On July 2, 1979, 73 acres of alfalfa in Vernal, Utah, were sprayed with an emulsifiable concentrate containing 6 lb/gal (50.77 kg/l) of ethyl parathion (parathion) and 3 lb/gal (25.2 kg/l) of methyl parathion. The material was applied at 4.15×10^{-2} gal/acre (3.89×10^{-3} l/ha). Wind conditions were negligible. Samples were taken from the sprayed plot (sites A and B) and from an adjoining non-target pasture (site C). Immediately after treatment, methyl parathion residues averaged 40% of ethyl parathion levels at the 3 sampling stations. A portion of the sample collected at Site C at 4 hr after spraying exceeded the tolerance for ethyl parathion on alfalfa hay. However, the average was below the 1.25 mg/kg limit. It is concluded that parathion residues on the entire mass of foliage were well below tolerance. Only the uppermost, exposed portions of the grass were sampled. Foliar residues of the parent phosphorothionates dissipated rapidly with time. At Site A the residues dropped below 1.25 mg/kg within 72 hr for ethyl parathion and within 28 hr for methyl parathion. First order half-lives of methyl and ethyl parathion were 12 and 16 hr, respectively. A dermal dose of 0.82 mg of ethyl parathion and 0.38 mg of methyl parathion would have been incurred by a bystander at Site C during spraying. Exposure would have been 4 times greater at the fence line separating treated and non-target fields. Combined exposures to both organophosphates equaled 17 μg/kg for a 70 kg male or up to 70 μg/kg on the immediate perimeter of the field.

81-2142. Draper, W. M.; Gibson, R. D.; Street, J. C. (Anim. Dairy & Vet. Sci. Dep., Utah State Univ., Logan, UT 84322) **Drift from and transport subsequent to a commercial, aerial application of carbofuran: an estimation of potential human exposure.** *Bull. Environ. Contam. Toxicol.* 26(4): 537-543; 1981 (6 references).

Two alfalfa fields located in Maeser, Utah, were treated aerially with Furaden 4-Flowable (carbofuran) at 0.5 kg AI/acre (0.565 kg/ha). Foliar carbofuran levels indicated some spray drift at both sites. There was considerable variability in residue levels among subsamples at each station due to the nature of the sampling. Grass or alfalfa samples were 0.1 kg, and representative samples were hard to obtain. When calculating potential human exposures it was determined that the maximum inhaled dose of carbofuran at Site A.3 during the aerial application and the subsequent volatilization period was 2.0 μg. Respiratory exposure at Site B.3 was estimated to be 0.7 μg. Potential dermal dosage incurred by an individual at Site A.3 would have been 3.1 mg of carbofuran. Assuming a continuum of values between Site A.1 and B.3 the maximum dermal dose receivable outside the treated field was 100 μg/kg. The dermal dose at Site A.3 on a per wt basis was about 44 μg/kg. Dermal exposure exceeded respiratory exposure by a large margin. During aerial sprayings carbofuran levels did not exceed 3.3 $\mu g/m^3$ at any location. The established threshold limit value for carbofuran is 50 $\mu g/m^3$.

81-2143. Wright, C. G.; Leidy, R. B.; Dupress, H. E., Jr. (Dep. Entomol., Pestic. Residue Lab., North Carolina State Univ., Raleigh, NC 27650) **Insecticides in the ambient air of rooms following their application for control of**

pests. *Bull. Environ. Contam. Toxicol.* 26(4): 548-553; 1981 (9 references).

Personnel type air samplers with Midget Impingers were placed near the center of test rooms in a vacant 3-story dormitory at North Carolina State University 1 day before the buildings were scheduled for insecticide application. Hinged beds were raised and the drawers of dressers and desks were removed during application and returned to original position after treatment. Closet doors were open. Each room had 2 windows which remained closed with shades lowered to the center of the window during treatment. Acephate, chlorpyrifos, diazinon, fenitrothion, and propoxur were applied as emulsions containing, 1.0, 1.5, 1.0, 1.0, and 1.1% concentrations, respectively. Bendiocarb was applied as a wettable powder at 0.5% concentration. Carbaryl was applied as a 5% dust. Each treatment was repeated once/wk for 4 wk. Before, immediately after, and at 1, 2, and 3 day intervals, the air was sampled for 4 hr to determine the amount of pesticide present. Very small quantities of diazinon and chlorpyrifos were found in pre-application samples. Carbaryl, bendiocarb and propoxur were not detected in pre-application air samples. Except for acephate, the highest concentration of each insecticide was present immediately following application. Propoxur, bendiocarb, and fenitrothion have the highest vapor pressures and were present at greatest amounts in the ambient air. Acephate, diazinon and chlorpyrifos have similar vapor pressures, and comparable levels were detected in the air. Carbaryl had the lowest vapor pressure and was present in the lowest amounts in the air.

81-2144. Chalmers, R. (Int. Consult. & Lab. Serv., Birmingham, England) **Amounts and effects of toxic materials discharged to sewers.** *Chem. Ind. (London)* (8): 271-277; 1981 (20 references).

A discussion of toxic compounds discharged into sewers is presented. Pesticides are considered an important class of toxicants in this review. There are over 500 individual pesticides of commercial importance, and as many as 34,000 distinct major formulated products. With respect to waste loads from pesticide manufacturing, there are three major categories: halogenated organic pesticide plants, organophosphorous pesticide plants, and organonitrogen pesticide plants. Data from each type of plant indicates that pre-treatment greatly reduces wastes from manufacturing processes. Halogenated organics decreased from 9.26 mg/l to 0.09 mg/l; organophosphorus compounds decreased from 10.34 to 0.04 mg/l; and organonitrogen pesticides decreased from 79.66 to 0.20 mg/l following pre-treatment.

81-2145. Sotiriou, N.; Klein, W. (Ges. Strahlen & Umweltforsch., Inst. Oekol. Chem., D-8042 Nueherberg, BRD) **Ein Langzeitversuch mit Nomolinuron- (phenyl-^{14}C) unter Freilandbedingungen. [Long-term experiment with (phenyl-^{14}C)-monolinuron under field conditions.]** *Chemosphere* 10(2): 147-152; 1981 (8 references) (German).

The distribution and elimination of ^{14}C-monolinuron was studied under field conditions in a 5-yr crop rotation (potatoes, winter barley, sugar beet, spring barley, potatoes). The dose applied was equivalent to 2.5 kg/ha. Monolinuron loss due to evaporation was 60% during the first year and even higher during subsequent years. Soil concentrations were highest in the top layer, but residues were found even at 20 cm depth during the first year, and in nearly all soil layers investigated during yr 5. Residues were very low in the edible parts of potato plants compared with the vegetative parts even during yr 1. Radioactivity was found in the plants even during yr 5, but it was significantly lower than that present during yr 1.

81-2146. Pramer, D.; Bartha, R. (Author address not given) **How pesticides affect the soil.** *Ecologist* 10(3): 83-86; 1980.

Various factors affect the behavior and fate of pesticides in soil, including leaching and the chemical structure of the compound involved. Some lipid soluble pesticides tend to accumulate in the fatty tissues of plants and animals. Pesticides such as DDT persist in the soil for years, while some (2,4-D) are degraded rapidly and completely. Others undergo partial decomposition, leaving metabolites as residues in the soil. A case study of the pesticide propanil was conducted. Propanil is used at levels of 1-6 lb/acre (1.13-6.78 kg/ha) for controlling weeds in rice growing regions of the world. Although propanil is biodegradable, microbial decomposition of the compound is not complete. The propanil molecule is metabolically split into propionic acid and 3,4-dichloroaniline (DCA). DCA is extremely reactive, producing several additional compounds, and it has an affinity for cellulose and other substances that occur in plant tissue. The interactions of pesticides and humus are also discussed. The binding of pesticide and pesticide residues to humus can be a strictly physical phenomenon or it can involve chemical bonding. Whatever the binding mechanism, it becomes inaccessible to detection by chemical methods generally employed to detect pesticides in the environment. It is not clear whether humus-bound pesticides or residues have any significant public health or ecological implications.

81-2147. Soos, K.; Ari, L.; Bejzath, J.; Kostyal, J. (Natl. Food & Nutr. Sci. Inst., Budapest, Hungary) **Poliklorozott bifenil (PCB) tartalom vizsgalata klorozott szenhidrogen inszekticidek mellett a hazai emberi zsirszovetben. [Determination of polychlorinated biphenyl (PCB) and chlorinated hydrocarbon insecticide content in human fatty tissue in Hungary.]** *Egeszsegtudomany* 24(4): 385-393; 1980 (35 references) (Hungarian).

A gas chromatographic procedure is described for

the parallel determination of polychlorinated biphenyls and chlorinated hydrocarbon insecticides in human fatty tissues. These substances were determined in the panniculus of 46 adults and 17 children from Budapest and 10 adults from Zalaegerszeg. Average PCB levels were 0.37 mg/kg in adults from Budapest, 0.26 mg/kg in adults from Zalaegerszeg, and 0.29 mg/kg in children from Budapest. These are significantly lower than values reported in countries that are more highly industrialized. DDT levels decreased significantly (from 5.4 to 1.3 mg/kg) 10 yr after the prohibition of DDT, but ΣDDT remained nearly unchanged (18 mg/kg). The β-HCH (β-BHC) level in fatty tissues was 0.73 mg/kg, while the level of hexachlorobenzene was fairly low (0.27 mg/kg).

81-2148. Anonymous **Pesticide residues in food.** *FAO Plant Prod. Prot. Paper* 15(Sppl): 291 pp.; 1979.

Monographs concerning 28 pesticide residues found in food are presented from the joint meeting of the FAO Panel of Experts on Pesticide Residues and the Environment, and the WHO Expert Group on Pesticide Residues. In addition, addenda are presented to previously published monographs, regarding several other pesticide residues. For each compound, data on evaluation for acceptable daily intake are presented. In some cases, where the information is available, residues in food, use patterns, and methods of residue analysis are also discussed. Recommendations are made for future study and, when possible, recommendations for Acceptable Daily Intake or residue limits are also made.

81-2149. Anonymous **Aminocarb.** *FAO Plant Prod. Prot. Paper* 15(Sppl): 1-3; 1979 (6 references).

Current information is presented on the evaluation of the pesticide aminocarb for acceptable daily intake. The sequence of degradation of aminocarb, based on *in vivo* and *in vitro* studies, is described. Toxicological information available is insufficient for the determination of an acceptable daily intake for humans. Surface residues of aminocarb are readily changed to less volatile products by photolytic modification of the 4-dimethylamino group, and the aminocarb is not persistent in the soil. Two methods of analysis (a GLC procedure and high-pressure liquid chromatography with UV detection) are apparently suitable for regulatory purposes.

81-2150. Anonymous ***sec*-Butylamine.** *FAO Plant Prod. Prot. Paper* 15(Sppl): 5-15; 1979 (12 references).

Data from Scotland and Ireland on the use and fate of *sec*-butylamine applied to potatoes are evaluated. Data from toxicological evaluations, residues in food, residues resulting from supervised trials, and the fate of residues in plants, animals, storage and processing are discussed, as are the methods of residue analysis. In Ireland and Scotland, limited approval has been given to the use of *sec*-butylamine on potatoes intended for human consumption. It has been determined that the bulk of the residue is in the outer layer and is removed by peeling, while up to half of that remaining is removed by cooking. No recommendations regarding allowable limits for this pesticide are made since there is a limited need to use *sec*-butylamine on potatoes and since there is a limited distribution of treated potatoes in international trade. It is suggested that work should be carried out on the question of carcinogenic risk, on metabolites, and on mutagenicity.

81-2151. Anonymous **Captan.** *FAO Plant Prod. Prot. Paper* 15(Sppl): 17-25; 1979 (4 references).

Data is presented regarding the evaluation of captan for an acceptable daily intake level. In mutagenicity studies, positive results were obtained using *Salmonella typhimurium* strain TA 1535, and weak mutagenicity was seen with a *Streptococcus coelicolor* plate technique. However, in tests where rats were dosed orally with captan, no abnormalities in bone marrow cell chromosomes were observed. A mouse dominant lethal study was also negative. Toxicologic studies have indicated the level causing no significant toxicological effect to be 1070 mg/kg body wt in mice, 100 mg/kg in rats and dogs, and 12.5 mg/kg in monkeys. The estimate of acceptable daily intake for humans is 0-0.1 mg/kg. A study of use patterns indicates that captan is approved in most countries for use on a wide variety of ornamentals and seeds. Data from various countries are presented on residues resulting from supervised trials. None of the information presented justifies amending the recommendations previously made. However, a maximum residue limit of 0.1 mg/kg potatoes was set.

81-2152. Anonymous **Carbendazim.** *FAO Plant Prod. Prot. Paper* 15(Sppl): 27-36; 1979 (7 references).

Information is presented regarding the evaluation of the pesticide carbendazim for possible establishment of an acceptable daily intake level. Use patterns are reported from various countries, as are residues resulting from supervised trials and the fate of residues during processing and storing. As an example, Australian studies on cherries indicate that application of 25 kg/ha pre-harvest result in residues of 1.0 mg/kg after 3 days, while application of 50 kg/ha post-harvest result in residues of 3.4 mg/kg after 3 days. In addition, national tolerances for five countries are also reported in various commodities. The additional information presented confirms the guidelines previously established for bananas, cherries, citrus fruits, peaches, strawberries, and lettuce. It is recommended that the guideline level for raw cereal be raised to 0.5 mg/kg, and that guidelines of 5 mg/kg for grapes and 3 mg/kg for potatoes (washed before analysis) be established.

81-2153. Anonymous **Cartap.** *FAO Plant Prod. Prot. Paper* 15(Sppl): 37-50; 1979 (15 references).

Data pertinent to the evaluation of the pesticide cartap for determination of an acceptable daily intake are presented. Studies on absorption, distribution, excretion and biodegradation are described. Cartap was found to be rapidly absorbed, metabolized, and excreted in rats and mice, with no storage of cartap or its metabolites in the body. In teratogenicity studies in mice, cartap did not show teratogenesis or fetotoxic effects at levels which have been shown to adversely affect maternal well-being. Similar studies in rats indicated that treatment with cartap through the period of organogenesis at dose levels of 50 mg/kg caused a slight reduction in fetal weight and a marginal reduction in development. Several mutagenicity assays produced negative results. Toxicological evaluations reveal the level causing no toxicological effect to be 20 mg/kg body wt/day in rats and 10 mg/kg body wt/day in dogs. The acceptable daily intake for man has been estimated to be 0-0.1 mg/kg body wt. Data is presented on cartap residues in tea, milk, and tissues of cows fed cartap hydrochloride in the diet. In dairy cows, intake results in transient accumulation of the insecticide in milk. Maximum residue limits are recommended for seven foods, and recommendations are made for future work on cartap.

81-2154. Anonymous **Chlordimeform.** *FAO Plant Prod. Prot. Paper* 15(Sppl): 51-78; 1979 (56 references).

Data is presented on studies used in the evaluation of the pesticide chlordimeform with regard to determination of an acceptable daily intake. In mutagenicity testing, chlordimeform and its metabolites were tested in *Salmonella* either alone or after biological activation. Chlordimeform was not mutagenic, but its main metabolite, 4-chloro-*o*-toluidine, was mutagenic in this system. No teratogenic effects were seen in studies on rabbits and rats. A series of short-term, high-level and long-term, low-level studies in rats and mice are described. Long-term studies have indicated chlordimeform and its principal metabolites to be carcinogenic in mice, but results from carcinogenicity studies in rats have been conflicting. Toxicological evaluations indicate the level which causes no toxicological effect is 5 mg/kg body wt in rats and 6.25 mg/kg body wt in dogs. The acceptable daily intake for humans has been estimated to be 0.0001 mg/kg body wt. Residues in food resulting from supervised trials are described, as is fate of residues in plants, in animals, in processing, and in soils. When cows were fed a diet containing up to 240 ppm chlordimeform for up to 42 days, there were no residues (< 0.03 mg/kg) in milk, fat or meat, but residues in animals, fed at the highest rates, ranged up to 0.6 mg/kg in liver and 0.1 mg/kg in kidney. Temporary maximum residue limits are recommended for cotton and dairy products and various meats, and recommendations are made for future research.

81-2155. Anonymous **Chlorothalonil.** *FAO Plant Prod. Prot. Paper* 15(Sppl): 79-83; 1979 (3 references).

Current information is presented on the pesticide chlorothalonil with regard to determination of a level of acceptable daily intake. Data are given on residues of chlorothalonil in some types of cereals during supervised trials. Summer wheat treated with liquid chlorothalonil (720 g/l) at a rate of 1.08 kg AI/ha showed residues of 0.777 mg/kg 21 days after spraying. Treatment of winter barley with the same formulation at a rate of 1.7 kg AI/ha resulted in residues of < 0.01 mg/kg after 47 days. It is recommended that after use of chlorothalonil at 1 to 3 kg AI/ha, a temporary maximum residue limit of 0.2 mg/kg be established (assuming a period of 6 wk between last application to harvest).

81-2156. Anonymous **Coumaphos.** *FAO Plant Prod. Prot. Paper* 15(Sppl): 85-87; 1979 (6 references).

Information regarding the evaluation of coumaphos with regard to establishment of acceptable daily intake level is presented. In trials in The Netherlands, cows were treated at a rate of 1.5 g/cow (50% wp) 2 times at 8 days intervals. Mean residues (mg/kg) present in milk at various intervals were: 6 hr., 0.25 mg/kg; 18 hr., 0.21 mg/kg; 30 hr., 0.13 mg/kg; and 42 hr., < 0.1 mg/kg. The maximum residue limits for various dairy and meat products currently in force in Australia and those under consideration in The Netherlands are reported. It is recommended that a maximum residue of 0.02 mg/kg (sum of coumaphos and its oxygen analogs) be established.

81-2157. Anonymous **Cyhexatin.** *FAO Plant Prod. Prot. Paper* 15(Sppl): 89-99; 1979 (14 references).

Data are presented regarding the evaluation of the pesticide cyhexatin with regard to determination of an acceptable daily intake and maximum residue limit. In a 2 yr feeding study on rats, there was no increase in the number of benign or malignant tumors, but there was a significant, dose-dependent increase in the incidence of focal bile hyperplasia. Thus, a previously established no-toxic-effect level for rats was withdrawn. The temporary acceptable daily intake for man was estimated to be 0.008 mg/kg body wt. Use patterns in various countries are described, as are residues in plants and animals resulting from supervised trials. A re-examination of residues in milk was necessary because of the direct application of cyhexatin sprays to dairy animals for mite control. Data indicate that when recommended treatment practices are followed, organotin residues in milk and butter were just about at the limit of detection (0.02 mg/kg for milk and 0.04 mg/kg for butter) at 24 hr after the last treatment. In addition, accumulation of cyhexatin in butterfat did not occur. Some temporary maximum residue limits are proposed, including 2 mg/kg for peaches, plums and strawberries; 0.5 mg/kg for beans, 0.2 mg/kg for meat, and 0.05 mg/kg for milk. It is recommended that future studies should include clarification of the no effect levels in the rat and elucidation of the possible effect of cyhexatin on the immune system.

81-2158. Anonymous **Diquat.** *FAO Plant Prod. Prot. Paper* 15(Sppl): 101-115; 1979 (27 references).

Data are presented which are pertinent to the evaluation of diquat with regard to the establishment of an acceptable daily intake. The most important potential source of human intake of diquat residues is wheat. Use patterns are discussed as are residues in cereal resulting from supervised trials and fate of residues in plants, animals and during processing. In data collected from six countries, diquat residues in desiccated wheat showed a mean of 0.5 mg/kg in the range of effective use rates. Diquat undergoes rapid and extensive photochemical degradation in plants and water, and diquat and its photoproducts are rapidly eliminated by ruminants. The national maximum residue limits are given for 7 countries for various cereal, meat and dairy products. The data presented generally confirm the maximum residue limits recommended previously. Three new recommendations for maximum residue limits are made: wheat bran, 5 mg/kg diquat ion; wheat flour (whole meal), 2 mg/kg diquat ion; and wheat flour (white), rice (hulled and/or polished), 0.2 mg/kg diquat ion.

81-2159. Anonymous **Ethephon.** *FAO Plant Prod. Prot. Paper* 15(Sppl): 117-122; 1979 (9 references).

Additional information on the pesticide ethephon is presented. In a short-term (90 day) study in rats in which ethephon was administered orally at doses ranging from 0 to 1500 mg/kg/day, 5 days/wk, growth depression was noted at 740 mg/kg and above. The highest dose produced mortality and histopathological changes, but clinical chemistry and gross examination of several tissues showed no specific adverse effects. The data were insufficient for determination of an acceptable daily intake. Use patterns were described, as were residues in foods following supervised trials and the fate of residues. Tests have shown that ethephon residues steadily increase in tomatoes, cherries, and apples for the first several days after treatment. Two modified methods of residues analysis are reported, along with one completely new rapid method based on the ethylene gas liberated by ethephon under basic conditions. Three guideline levels were established in addition to those previously recorded. They are: grapes, 10 mg/kg (based on a harvest interval of 7 days after treatment); onions, 0.5 mg/kg (interval of 4 wk); and peaches, 0.5 mg/kg (interval of 6 wk).

81-2160. Anonymous **Ethiofencarb.** *FAO Plant Prod. Prot. Paper* 15(Sppl): 123-125; 1979 (4 references).

Further information on the pesticide ethiofencarb is presented to the Joint Meeting of the FAO/WHO. Data are presented on residues resulting from supervised trials with ethiofencarb in various crops. As an example, application of 0.25 kg AI/ha to wheat resulted in residues of 0.02 mg/kg after 42-46 days. Application of 1.5 kg AI/ha to potatoes resulted in residues of < 0.02 mg/kg after 91 days. Treatment of sugar beet with ethiofencarb at a rate of 0.5 kg AI/ha resulted in residues of 0.05, 0.04, and 0.02 mg/kg after 16-23, 77 and 91 days, respectively. The data support previously made recommendations.

81-2161. Anonymous **Fenamiphos.** *FAO Plant Prod. Prot. Paper* 15(Sppl): 127; 1979.

Information related to establishment of a maximum residue limit for the pesticide fenamiphos in carrots is reviewed. Supervised trials carried out in Australia indicate that carrots treated at a rate of 9 kg AI/ha contained residues of 0.08, 0.13, 0.07, 0.05, 0.04, 0.04, and 0.02 mg/kg after 93, 100, 103, 107, 116, 122, and 136 days, respectively. At an application rate of 13 kg AI/ha, residues were 0.13, 0.10, and 0.09 mg/kg after 93, 103 and 122 days, respectively. These data and data presented at earlier sessions led to a recommendation of a limit of 0.2 mg fenamiphos/kg in carrots.

81-2162. Anonymous **Fenthion.** *FAO Plant Prod. Prot. Paper* 15(Sppl): 129-137; 1979 (11 references).

Data pertinent to the evaluation of the pesticide fenthion are presented. Various toxicological studies were performed, including a teratogenicity test in which rats given up to 10 mg fenthion/kg/day on days 6-15 of pregnancy exhibited no teratogenic effects. In a long-term study on rats, 15 and 75 ppm fenthion caused dose-dependent depression of plasma and erythrocyte cholinesterase activity. The levels causing no toxicological effects were 0.15 mg/kg in rats, 0.05 mg/kg in dogs, and 0.07 mg/kg in monkeys. The temporary acceptable daily intake for man was estimated to be 0-0.0005 mg/kg body wt. Use patterns are described, as are residues in food resulting from supervised trials. For example, a single application of fenthion to pears at a rate of 250 g/100 *l* resulted in 0.08-0.21 mg/kg residues 7 days after treatment and 0.02 mg/kg 14 days after treatment. Fenthion was only occasionally detected in the national residue monitoring program in Australia. Suggestions are made for further work to be carried out on fenthion.

81-2163. Anonymous **Guazatine.** *FAO Plant Prod. Prot. Paper* 15(Sppl): 139-158; 1979 (39 references).

Data pertinent to the evaluation of the pesticide guazatine are described. Information is presented regarding the identity, properties and formulations of the compound, and biochemical aspects (absorption, distribution, excretion) are elucidated. Rats given a single oral dose of labelled guazatine excreted 80% of the dose within 72 hr, with no evidence of tissue accumulation. Long- and short-term studies have been performed on various animals. A no-effect level of 200 ppm has been determined in rats and

dogs. A 3-generation study has shown no effects on reproduction or teratogenicity. No differences in tumor incidences were seen between control and treated groups. Use patterns are described, as are residues in foods resulting from supervised trials, and fate of residues in animals, plants, and soils. Analysis of barley, oat, rye and wheat grown from guazatine-treated seed, pineapple from treated seed pieces, and sugar cane, bagasse, molasses and raw sugar grown from treated setts all showed no guazatine residues. Guazatine rapidly degrades in the soil. Some maximum residue limits are recommended, and recommendations are made for further research.

81-2164. Anonymous **Hexachlorobenzene.** *FAO Plant Prod. Prot. Paper* 15(Sppl): 159-164; 1979 (22 references).

Data pertinent to the evaluation of hexachlorobenzene (HCB) are presented. In carcinogenicity studies mice were fed up to 200 ppm HCB in their diet for life; doses of 100 and 200 ppm caused an increase in the incidence of hepatomas. A similar study in hamsters indicated an increase in hepatomas, hemangioendotheliomas, and thyroid adenomas at doses of 50, 100 and 200 ppm. Some effects on reproduction were seen in rats. In mice an oral dose of 100 mg/kg on gestational day 7-16 resulted in 13% abnormal fetuses/litter (compared to 7% in untreated litters). In short-term studies, a no-effect level of 0.5 mg/kg was determined in rats. The corresponding level for pigs was 0.05 mg/kg. In an epidemiological study of persons living near an HCB-manufacturing plant abnormally high plasma coproporphyrin levels of 3.6 ppb were measured. It is concluded that the toxicity of HCB is such that contamination of food should be kept as low as possible. The previous FAO conditional acceptable daily intake has been withdrawn.

81-2165. Anonymous **Leptophos.** *FAO Plant Prod. Prot. Paper* 15(Sppl): 165-168; 1979 (12 references).

Information pertinent to the evaluation of leptophos is presented. Data on biochemical aspects and neurotoxicity are discussed. In a study on rats a major quantity of leptophos was eliminated in 48 hr, but trace residues were evident in omental and subcutaneous tissues for as long as 12 wk after a single acute oral dose of 15 mg/kg. In neurotoxicity studies on hens fed 0.1-100 ppm leptophos in their diet for 1 yr, clinical sings of ataxia were initially noted at 58 days in the group fed 100 ppm. When 1 wk old mallard ducklings were exposed to 260 ppm leptophos, clinical signs of ataxia developed within 17-23 days, with eventual progression to paralysis. A study of 9 workers occupationally exposed to leptophos revealed paresthesia of the extremities in 8 workers, decreased motor function and decreased muscle tone in 6, 2 abnormal EMGs and 2 abnormal EEGS. In another study of 32 individuals exposed to leptophos in an agricultural spray program, many showed cholinesterase depression; recovery was generally slow.

81-2166. Anonymous **Lindane.** *FAO Plant Prod. Prot. Paper* 15(Sppl): 169-173; 1979 (1 reference).

Data pertinent to the evaluation of lindane is presented. Information on residues of lindane in dairy products is summarized in tabular form. From these data it is suggested that a maximum residue limit for whole milk of 0.2 mg/kg (fat basis) would be more appropriate than the current recommended value of 0.1 mg/kg. Results are also presented on the residues of lindane in cocoa beans and cocoa products produced in various countries. Of 151 samples of unroasted cocoa beans from 13 countries, 43 contained non-detectable (nd) lindane residues, 39 contained lindane residues in the range of 0.001-0.010 mg/kg, 35 from 0.011 to 0.030 mg/kg, 22 from 0.031 to 0.100 mg/kg, and 12 from 0.101 to 0.400 mg/kg. Analysis of lindane residues in cocoa butter showed a range of nd to 2.5 mg/kg. Maximum residue limits of 0.01 mg/kg for whole milk, 0.2 mg/kg for milk products (fat basis) and 1 mg/kg for cocoa butter and cocoa mass.

81-2167. Anonymous **Methomyl.** *FAO Plant Prod. Prot. Paper* 15(Sppl): 175; 1979.

Information presented to the FAO/WHO regarding the evaluation of methomyl is discussed. No determination of acceptable daily intake has been possible due to lack of data. A high-pressure liquid-chromatography procedure for residue analysis has been reviewed, but its utility for regulatory purpose, especially at levels < 2 mg/kg, must still be established. It is suggested that future work should be carried out concerning methods of analysis and the disappearance of residues during storage.

81-2168. Anonymous **Omethoate.** *FAO Plant Prod. Prot. Paper* 15(Sppl): 177-179; 1979 (4 references).

Information pertinent to the evaluation of omethoate is described. Biochemical aspects of the compound, which is a direct inhibitor of cholinesterase activity, are discussed. Studies on depression of brain cholinesterase activity in rats suggest this enzyme to be the most sensitive parameter for evaluating the anticholinesterase effect of omethoate. Levels causing no toxicological effects have been determined to be 0.05 mg/kg in rats and 0.12 mg/kg in dogs. The temporary acceptable daily intake for man has been estimated to be 0-0.0005 mg/kg body wt. Data were also presented on omethoate residues in food. New Zealand studies showed that of 16 retail samples of apples, 10 contained 0-0.2 mg/kg omethoate (mean 0.14 mg/kg). In apples known to have been treated with omethoate, mean residue levels of 0.13 and 0.66 mg/kg were obtained during 2 different tests. All values were within the maximum residue limit of 2 mg/kg.

81-2169. Anonymous **Paraquat.** *FAO Plant Prod. Prot. Paper* 15(Sppl): 181-183; 1979 (2 references).

Information pertinent to the evaluation of the pesticide paraquat is described. In tests in which sunflower seeds were treated with paraquat at application rates of 0.25 or 0.50 kg AI/ha, residues of up to 0.9 mg/kg were found in the whole seed. Residues of up to 1.2 mg/kg were found in sunflower meal. No residues were found in the oil. Although sunflower meal is a component of the diet of hens, dairy cattle and other livestock animals, the percentage used and the level of residue indicates that it would be impossible for animal products to contain paraquat in excess of the current standard. A maximum residue limit of 2 mg/kg is confirmed for dry sunflower seed, and limits of 2 and 0.05 mg/kg are recommended for sunflower meal and sunflower oil.

81-2170. Anonymous **Parathion-methyl.** *FAO Plant Prod. Prot. Paper* 15(Sppl): 185-192; 1979 (4 references).

Data pertinent to the evaluation of parathion-methyl (methyl parathion) are presented. Use patterns and residues in foods resulting from supervised trials are described. Information presented on soybeans, soybean forage, cottonseed, green beans, cabbage, and various other crops indicates very low residues, if any, 14 days after application. Soybeans field-treated with parathion-methyl at a rate of 1.1 kg AI/ha showed parathion-methyl residues of 14.6, 3.7, 1.9, 1.1 and ND at 1, 5, 7, 14 and 16 days after application, respectively. In national residue surveys carried out in Australia and New Zealand, parathion-methyl has seldom been detected, and never at levels exceeding establishing maximum residue limits.

81-2171. Anonymous **Phosmet.** *FAO Plant Prod. Prot. Paper* 15(Sppl): 193-207; 1979 (32 references).

Information on the pesticide phosmet is discussed with regard to the establishment by the FAO/WHO of an acceptable daily intake and maximum residue limit. Biochemical aspects are discussed, as are the results of short- and long-term toxicity studies and tests on reproduction, teratogenicity and mutagenicity. Phosmet is rapidly absorbed, metabolized and excreted in mammals, and is not thought to bioaccumulate in adipose tissue. Studies on hens showed no delayed neurotoxic potential for phosmet, and several mutagenicity assays were negative. Teratogenicity studies in a variety of species have, with one exception, been negative. Additional work is required to clarify the teratogenic potential of phosmet. Reproduction studies in rabbits and rats indicated no effect of phosmet. Short- and long-term bioassays in dogs and rats are described, and no significant effects were seen on a variety of physiological, biochemical, and pathological parameters. However, cholinesterase depression, a sensitive indicator of effect, was observed at high dietary levels in all tests. Levels causing no significant toxicological effect were determined to be 2.0 mg/kg in rats and 1.9 mg/kg in dogs. The temporary acceptable daily intake for man has been determined to be 0-0.0005 mg/kg body wt. Temporary maximum residue limits are recommended for several fruits.

81-2172. Anonymous **Pirimicarb.** *FAO Plant Prod. Prot. Paper* 15(Sppl): 209-220; 1979 (14 references).

Information on the pesticide pirimicarb is presented with regard to establishment of acceptable daily intake levels by the FAO. Oral treatment (10-50 mg/kg) in dogs resulted in hemolytic anemia; however, no such response was seen in monkeys. A dose of 25 mg/kg in dogs and monkeys resulted in cholinesterase inhibition. Studies in rats indicate growth impairment resulting from 250 ppm in the diet. A review of data on residue levels in various foods (grains, eggs, milk and meat) allowed establishment of temporary maximum residue limits.

81-2173. Anonymous **Propargite.** *FAO Plant Prod. Prot. Paper* 15(Sppl): 221-226; 1979 (3 references).

Information on propargite was analyzed to evaluate FAO/WHO acceptable daily intake levels. Field tests indicated that it would be unlikely for residues to exceed 2 mg/kg on apples, 2 mg/kg on tomatoes, and 0.5 mg/kg on cucumbers. Tests on tea indicated that levels of 5 mg/kg would not be exceeded. Trials on bush beans indicated no significant translocation of either the parent compound or metabolites occurred. The residue on the beans was 60.4% propargite. The temporary maximum residue limits range from 0.5 to 5 mg/kg.

81-2174. Anonymous **Tecnazene.** *FAO Plant Prod. Prot. Paper* 15(Sppl): 227-238; 1979 (41 references).

Data on tecnazene were evaluated for the purpose of recommending acceptable daily intake levels. Studies on mice indicated the possibility of a skin tumor-initiating effect of tecnazene. However, the small numbers of mice used preclude definite conclusions. Feeding studies did not indicate carcinogenic activity. Doses of 750-1500 ppm revealed no treatment effect. Only a temporary acceptable daily intake level could be determined because of the lack of data of this pesticide: 0-0.01 mg/kg was determined to be acceptable.

81-2175. Anonymous **Trichlorfon.** *FAO Plant Prod. Prot. Paper* 15(Sppl): 239-255; 1979 (26 references).

Data on trichlorfon were evaluated for the purpose of establishing acceptable daily intake levels. When administered to mice, trichlorfon at rates of 20-30 mg reduced survival time, but did not appear to increase the incidence of tumors. Rats exposed to the pesticide in the air showed reduced cholinesterase activity in plasma, erythrocytes and

brain of males. Females showed a definite dose-related response, with considerably greater inhibition at 103.5 mg/m³ than was seen at 35.4 mg/m³. Acceptable daily intake for man was established at 0-0.01 mg/kg. Based on residue data, maximum residue levels were established, ranging from 0.05 to 2 mg/kg.

81-2176. Anonymous **Triforine.** *FAO Plant Prod. Prot. Paper* 15(Sppl): 257-279; 1979 (40 references).

Data on triforine toxicity were analyzed in order to assess human health requirements associated with ingestion of this pesticide. Concentrations of up to 2500 ppm failed to produce any visible adverse effects on reproduction in rats. Female rats fed 100, 400, 800 or 1600 mg/kg triforine from days 6-15 of gestation exhibited embryotoxic, but not teratogenic, effects. In a carcinogenicity study, rats were fed up to 750 ppm triforine for 81 wk with no tumorigenic activity noted. Various concentrations of the pesticide (625 ppm or more) induced hemolytic anemia. An estimated acceptable daily intake for humans was given as 0-0.02 mg/kg. Maximum residue limits on food items range from 0.02 to 5.0 mg/kg.

81-2177. Anonymous **Annex 1. Acceptable daily intakes, residue limits and guideline levels proposed at the 1978 session.** *FAO Plant Prod. Prot. Paper* 15(Sppl): 281-293; 1979 (39 references).

Annexes are presented to a publication of the Joint Meeting of the FAO Panel of Experts on Pesticide Residues and the Environment and the WHO Expert Group on Pesticide Residues, 1978. The acceptable daily intakes, residue limits and guideline levels for 38 pesticides proposed at the meeting are listed. Also included are references to previous FAO and WHO documents.

81-2178. Ballschmiter, K.; Buchert, H.; Bihler, S.; Zell, M. (Abt. Anal. Chem., Univ. Ulm, D-7900 Ulm, BRD) **Baseline studies of the global pollution. IV. The pattern of pollution by organochlorine compounds in the North Atlantic as accumulated by fish.** *Fresenius Z. Anal. Chem.* 306(5): 323-339; 1981 (34 references).

Fish and fish oils, which can be assigned to defined food webs, habitats and regions in the North Atlantic (Gulf Stream, Sargasso Sea, contained shelf of Iceland, Ireland, Norway, North Sea and Portugal) have been analyzed for organochlorine compounds like hexachlorocyclohexane isomers (HCH; BHC), chloroterpene (toxaphene, polychlorocamphene), cyclodiene pesticides (chlordane group, dieldrin), chlorobenzenes, chlorobiphenyls (PCB) and the DDT group. Phytoplankton feeding fish menhaden *(Brevoortia tyrannus)* were used to characterize the surface layer of the Atlantic west of the United States, while ground feeding predatory cod *(Gadus morhua)* and sea pike *(Merluccius merluccius)* should picture mainly the pollution near the continental shelf at 200-600 m depth. All groups of chemicals listed above could be found in the fish samples and in most cases the single components of mixtures (PCB, chlordane) could be identified by high resolution glass capillary gas chromatography with electron capture detection. Intensity and details of the pollution pattern vary strongly for the water regions investigated. The global water cycle and details of pollution input and history of water bodies can be used for an explantation. (Author abstract by permission)

81-2179. Prati, L.; Cenci, P.; De Bartolomeo, A. (Ist. Ig., Univ. Ferrara, I-44100 Ferrara, Italy) **Ricerca di ditiocarbammati residui negli alimenti di origine vegetale. [Spectrophotometric determination of dithiocarbamate residues in foods of vegetable origin.]** *Ig. Mod.* 75(2): 147-162; 1981 (18 references) (Italian).

Dithiocarbamate residue levels were studied in market samples of vegetables and fruits (asparagus, beets, carrots, chicory, beans, peas, lettuce, tomatoes, potatoes, spinach, zucchini, oranges, bananas, figs, lemons, melons, pears, peaches, and grapes) in the Ferrara area by spectrophotometric methods. Dithiocarbamate residues were found in 26% of the samples analyzed. The residue levels exceeded the official tolerance limit in 2% of all samples. The residue levels were highest in dry beans and lettuce. Operative variations in the spectrophotometric method are described in detail.

81-2180. Singh, K. P.; Pandey, S. Y.; Singh, S.; Rao, L. (Res. & Dev. Cent., Union Carbide India Ltd., Bhopal 462013, India) **Note on the extent of aldicarb residues in wheat.** *Indian J. Agric. Sci.* 50(12): 983-985; 1980 (7 references).

A note is presented in which aldicarb residues in wheat are discussed. Wheat was dosed with either 2.0 or 4.0 kg AI/ha in a granular formulation. The low dose resulted in no detectable aldicarb in grain, straw, or soil 145 days after application. The higher dose resulted in an average of 0.027 ppm aldicarb in the grain. None was detected in the straw or soil. It appears from these results that the application of aldicarb granules to wheat crop is safe with respect to toxic residues.

81-2181. Kannan, N.; Jayaraman, J. (Dep. Biochem., Sch. Biol. Sci., Madurai Kamaraj Univ., Madurai 625021, India) **Impact monitoring of pesticide residues of rice plant (*Oryzae sativa* L.).** *Indian J. Biochem. Biophys.* 17(4): 6; 1980.

The dynamics of methyl parathion, fenitrothion, malathion and endosulfan residues in rice plants were determined in rice plants by gas chromatography. Residues

in leaves, harvested whole grain and dehusked grains declined for 15 days. Sun drying and par boiling reduced the pesticide residues to 90%. Although the decline of these pesticide residues in rice plant leaves was fast, levels were still greater than EPA tolerance limits after 15 days. Pesticide residues in whole grain and dehusked grain were also above EPA tolerance limits. Factors affecting pesticide residues in various parts of rice plants were also discussed. [Presented at the 1979 annual meeting of Indian biochemists.]

81-2182. Siddiqui, M. K. J.; Kaphalia, B. S.; Seth, T. D.; Bhargava, A. K.; Saxena, M. C. (Ind. Toxicol. Res. Cent., Lucknow 226001, India) **Acetylcholinesterase activity in red blood cells of pregnant women & their foetus.** *Indian J. Biochem. Biophys.* 17(4): 79-80; 1980.

Organophosphorus pesticides have been shown to inhibit the acetylcholinesterase activity (AChE) of red blood cells. The activity of AChE in the red blood cells of pregnant women was measured in the third trimester of pregnancy a few hr before and after delivery. Variations in enzyme activity before and after delivery were observed which were related to the mothers' age. AChE activity of the umbilical cord blood was also measured. These findings may provide background information for the use of AChE measurements as a diagnostic test of pesticide exposure. [Presented at the 1979 annual meeting of Indian biochemists.]

81-2183. Chiba, M.; Veres, D. F. (Res. Stn., Agric. Canada, Vineland Station, Ontario L0R 2E0, Canada) **Fate of benomyl and its degradation compound methyl 2-benzimidazolecarbamate on apple foliage.** *J. Agric. Food Chem.* 29(3): 588-590; 1981 (10 references).

Changes in residues of benomyl and its degradation compound methyl 2-benzimidazolecarbamate (MBC or carbendazim) on apple foliage were determined in experiments conducted in two different years. Benomyl and MBC were simultaneously determined by a rapid high-performance liquid chromatographic method without cleanup using a silica gel column. Benlate (benomyl) fungicide 50% WP at 1.68 kg (3.36 kl)/ha was applied as a spray and the original benomyl deposits ranged from 95 to 120 μg/g of leaf (0.95-1.2 μg/cm^2 of leaf surface). Benomyl dissipated quickly during the first 3-7 days, but the dissipation slowed down thereafter. Twelve days after each application at least 15% of the original deposit existed as intact benomyl. Benomyl gradually converted to MBC, and the MBC concentration in leaves gradually increased after repeated application of Benlate. The MBC concentration remained above 17 μg/g for ~80 days as a result of 3 applications; the maximum concentration, 55.8 μg/g, occurred 8 days after the third application. (Author abstract reprinted by permission of the American Chemical Society)

81-2184. Gile, J. W.; Gillet, J. W. (Terr. Div., Corvallis Environ. Res. Lab., US EPA, Corvallis, OR 97330) **Transport and fate of organophosphate insecticides in a laboratory model ecosystem.** *J. Agric. Food Chem.* 29(3): 616-621; 1981 (12 references).

The disposition of ^{14}C-labeled methylparathion, parathion, and *p*-nitrophenol applied as a foliar spray was examined in the Terrestrial Microcosm Chamber (TMC) and compared to a reference compound, dieldrin. The impact of soil type (synthetic *vs.* natural) and airflow rates through the chamber on methylparathion disposition were evaluated. The TMC contained either a synthetic soil medium or Willamette sandy loam soil plus agricultural crops, numerous invertebrates, and a gravid gray-tailed vole *(Microtus canicaudus)*. Dieldrin was accumulated to a lesser extent than any of the organophosphates in the synthetic soil. Concentrations of methylparathion in the upper layer of Willamette sandy loam soil were consistently lower than those observed with the synthetic medium. Increased airflows altered methylparathion distribution primarily through increased export from the TMC. Although recovery of dieldrin was lower than with equivalent applications of organophosphates, a significantly greater concentration was detected in the vole. Only dieldrin appeared to affect vole survival. (Author abstract reprinted by permission of the American Chemical Society)

81-2185. Allen, J. L.; Sills, J. B.; Dawson, V. K.; Amel, R. T. (Natl. Fish. Res. Lab., US Fish & Wildl. Serv., La Crosse, WI 54601) **Residues of isobornyl thiocyanoacetate (Thanite) and a metabolite in fish and treated ponds.** *J. Agric. Food Chem.* 29(3): 634-636; 1981 (9 references).

Isobornyl thiocyanoacetate (Thanite) is an insecticide that induces a surfacing response in fish and therefore has been considered to have potential as a fish collecting agent. Analyses for residues of Thanite in carp *(Cyprinus carpio)* and largemouth bass *(Micropterus salmoides)* exposed to the chemical yielded only a trace of the parent compound. A metabolite, isobornyl α-(methylthio)acetate, was isolated and identified by GC-MS and a reference standard for the metabolite was synthesized. Residues of the metabolite were present in largemouth bass muscle tissue within 1 hr after exposure to Thanite. The metabolite was also observed in the muscle, blood plasma, and bile of carp. Residues of the metabolite are rapidly eliminated after the fish are transferred to Thanite-free water. Residues of Thanite in water, algae, and soil from ponds treated with Thanite declined to undetectable levels within 28 days after treatment. (Author abstract reprinted by permission of the American Chemical Society)

81-2186. Sirons, G. J.; Zilkey, B. F.; Frank, R.; Paik, N. J. (Prov. Pestic. Test. Lab., Ontario Min. Agric. & Food, Guelph, Ontario N1G 2W1, Canada) **Residues of**

diphenamid and its phytotoxic metabolite in flue-cured tobacco. *J. Agric. Food Chem.* 29(3): 661-664; 1981 (14 references).

Diphenamid (*N,N*-dimethyl- 2,2-diphenylacetamide) has been registered and used to control weeds in flue-cured tobacco (*Nicotiana tabacum* L.) since 1975. Surveys of tobacco leaf being offered for sale on the Ontario auction floors in 1976 and 1977 revealed residues of less than 0.5 mg/kg where the phytotoxic metabolite *N*-methyl-2,2-diphenylacetamide predominated. At the same time only trace residues of the less phytotoxic metabolite 2,2-diphenylacetamide were detected. Diphenamid and its metabolites were extracted with benzene and quantitated on an electroconductivity (Coulson) detection system with a detection limit of 0.01 mg/kg. The obtained data indicated that diphenamid was converted into *N*-methyl-2,2-diphenylacetamide and 2,2-diphenylacetamide as the major and minor metabolites, respectively. Flue-cured tobacco crops were treated at the prescribed rate of 6.75 kg of active ingredient/hectare (AI/ha) on a 25-cm band or 1.6 of AI/ha on a whole-field basis, and residues ranged from 9 mg/kg in the sand leaves to 0.2 mg/kg in the tip leaves. It is suggested that rapid translocation and stepwise demethylation are the protective degradation mechanisms. (Author abstract reprinted by permission of the American Chemical Society)

81-2187. Hill, A. R.; Smart, N. A.* (Harpenden Lab., Agric. Sci. Serv., Min. Agric. Fish. & Food, Harpenden, Hert, AL5 2BD, England) **Dehydrochlorination of some organochlorine pesticides in freeze-dried egg and egg fat during storage.** *J. Agric. Food Chem.* 29(3): 677-679; 1981 (11 references).

Dehydrochlorination of α-HCH (α-BHC), γ-HCH (lindane), and *p,p'*-DDT in freeze-dried egg or extracted egg fat can take place over a period of several days. Other, more stable, organochlorine pesticide residues are not affected. The technique for fat extraction influences subsequent decomposition. (Author abstract reprinted by permission of the American Chemical Society)

81-2188. Kreiss, K.; Zack, M. M.; Kimbrough, R. D.; Needham, L. L.; Smrek, A. L.; Jones, B. T. (Chronic Dis. Div., Cent. Dis. Control, Atlanta, GA 30333) **Cross-sectional study of a community with exceptional exposure to DDT.** *J. Am. Med. Assoc.* 245(19): 1926-1930; 1981 (23 references).

The geometric mean level of total DDT in serum samples (76.2 ng/ml) from 499 persons living downstream from a defunct DDT-manufacturing plant was several times the national geometric mean (15.0 ng/ml). DDE isomers, metabolites of DDT, accounted for an average of 86.7% of total DDT. Total DDT levels increased with age, even when controlled for other independent variables also significantly associated with DDT: race, sex, fish consumption, years of residence, socio-economic status, alcohol consumption, and serum triglyceride levels. Fish consumption, the second strongest determinant of DDT level, had one third the predictive power of age. Total DDT levels were not associated with specific illness or ill health. However, total DDT levels were positively associated with levels of serum cholesterol, triglyceride, and γ-glutamyl transpeptidase. The finding that serum DDE levels increase with age suggests that no equilibrium in body burden has been reached or that pharmacokinetics or serum/adipose partition may vary with age. (Author abstract by permission)

81-2189. Chatterjee, D. K.; Kellogg, S. T.; Hamada, S.; Chakrabarty, A. M. (Dep. Microbiol. & Immunol., Med. Cent., Univ. Illinois, Chicago, IL 60612) **Plasmid specifying total degradation of 3-chlorobenzoate by a modified *ortho* pathway.** *J. Bacteriol.* 146(2): 639-646; 1981 (26 references).

Chlorobenzoates occur in the environment due to their release as herbicides or as products of PCB cometabolism. The characterization of a transmissible plasmid that specifies a complete 3-chlorobenzoate-biodegradative pathway in a strain of *Pseudomonas putida* is presented. The plasmid was termed pAC25. There was an accumulation of 3-chlorocatechol and β-chloromuconic acid as intermediates during the growth of the plasmid-harboring cells with 3-chlorobenzoate. A release of > 80% of the chlorine in the form of inorganic chloride was also noted. The plasmid had a mean molecular mass of 68,000,000 dal and was transmissible to a number of *Pseudomonas* species including *P. aeruginosa, P. putida* strain PpG1, and *P. putida* strain PRS1. The transfer of pAC25 to various catechol-negative mutants of *P. putida* strain PRS1 demonstrated that the chromosomally coded pyrocatechase was not complemented by the plasmid-specified pyrocatechase, which appeared to be specific for the chlorinated catechols. In contrast the benzoate, which was metabolized by the *ortho* pathway through β-ketoadipate as an intermediate, the plasmid specified *ortho* cleavage of the chlorocatechols through maleylacetate as an intermediate.

81-2190. McGaughey, W. H.; Dicke, E. B.; Finney, K. F.; Bolte, L. C.; Shrogen, M. D. (US Grain Market. Res. Lab., Agric. Res., SEA, USDA, Manhattan, KS 66502) **Spores in dockage and mill fractions of wheat treated with *Bacillus thuringiensis*.** *J. Econ. Entomol.* 73(6): 775-778; 1980 (6 references).

Dockage fractions of wheat treated with *Bacillus thuringiensis* Berliner contained more spores than whole wheat, but 75-85% of the spores remained on the wheat after cleaning. Tempering of the wheat prior to milling reduced viable spore counts by half. More spores were present on the outside layers of the wheat than on the flour.

Flour contained 1-5% of the initial number of spores, and bread baked from it contained few or no viable spores. Flour absorptions, bake mixing times, mixogram mixing times, other physical properties of the dough, and bread loaf volumes, of flour from treated wheat were essentially the same as those for the controls. Thus, the *B. thuringiensis* treatments had no effect on the baking qualities of flour from treated wheat. (Author abstract by permission)

81-2191. Bansal, O. P.; Prasad, M. (Chem. Lab., D. S. Coll., Aligarh, India) **Kaolinite oxamyl interactions.** *J. Indian Chem. Soc.* 57(12): 1226-1231; 1981 (28 references).

The adsorption of two different concentrations of oxamyl was studied as a function of time on H-, Na-, and Ca-saturated kaolinite clays. Adsorption increased with time up to an interval of 33 hr, after which it became constant. Such a slow rate of attaining the equilibrium indicates that process is at least partly of chemical nature. Kinetic studies showed the reaction to be of first order. Maximum adsorption occurred at pH 6.5. The adsorption isotherms and desorption experiments provide evidence for part chemisorption and part physical adsorption of oxamyl on these clay surfaces. Inferences on the protonation of the carbonyl oxygen of the oxamyl molecule by hydrogen ions on kaolinite and/or the coordination of the metallic cations of kaolinite to the carbonyl of the amide group found support from adsorption isotherms, thermodynamic parameters, X-ray and IR studies.

81-2192. Barquet, A.; Morgade, C.; Pfaffenberger, C. D. (Chem. Epidemiol. Div., Dep. Epidemiol., Sch. Med., Univ. Miami, Miami, FL) **Determination of organochlorine pesticides and metabolites in drinking water, human blood serum, and adipose tissue.** *J. Toxicol. Environ. Health* 7(3-4): 469-479; 1981 (8 references).

Analysis of the blood serum of 59 white female residents of Dade County for 10 organochlorine pesticides and their metabolites revealed the presence of low levels of hexachlorobenzene (HCB), β-HCH, (β-BHC), *p,p'*-DDE, dieldrin, and *p,p'*-DDT. With the exception of *p,p'*DDE, serum levels of the organochlorines were generally in the range of 0.1-0.9 ppb. The overall average serum level of *p,p'*-DDE was about 18 ppb. No significant differences were recorded between individuals who had been drinking municipal water and those who has been drinking well water over the prior 5 yr period. Some samples of municipal water contained traces of HCB and dieldrin. HCB was not found in well water, but traces of dieldrin were often present. It is concluded that food is probably a more significant source of organochlorine exposure. Analysis of 10 necropsy adipose tissue samples suggested low storage of organochlorines in fat. With the exclusion of *p,p'*-DDE and *p,p'*-DDT, fat storage levels were generally 0.06-0.35 ppm. Average levels of *p,p'*-DDT and *p,p'*-DDE in fat were 0.81 and 5.91 ppm, respectively.

81-2193. Shirko, T. S.; Grober, M. I. (Byelorussian Res. Inst. Potato Veg. & Fruit Grow., USSR) **Ostatki Metazina v pochve, morkovi i klubiyakh kartofelya. [Metazine residues in soil, carrot and potatoes.]** *Khim. Sel'sk. Khoz.* 19(3): 54-56; 1981 (4 references) (Russian).

To evaluate the migration and metabolism of the herbicide Metazine (2-*N*-methyl-*N*- cyano-4,6-*bis*- (isopropylamino)-*sym*-triazine), its residues in the soil, carrrot and potato bulbs were determined. Soddy-podzolic soil was sprayed with Metazine at 1, 2 and 3 kg/ha prior to crop emergence and samples were taken within different periods of vegetation and during harvest. The rate of Metazine degradation in the soil depended upon the dose applied, crop type and weather conditions. During harvest, only trace amounts of herbicide were detected in a 0-10-cm soil layer. Metazine residues could not be detected in potato bulbs. Carrot contained 0.01 mg/kg.

81-2194. Gulibov, A. M.; Volkotrub, E. N. (All-Russian Res. Inst. Plant Prot., Leningrad, USSR) **Ustroistvo dlya izucheniya migratsii gerbitsidov. v pochve. [Device for the study of herbicide migration in soil.]** *Khim. Sel'sk. Khoz.* 19(3): 56-57; 1981 (4 references) (Russian).

A special device for the analysis of herbicide migration in soil was developed. The device consists of a vinyl tube filled with soil. A 6 cm segment is cut along the length of the tube. Prior to tube filling, the segment is attached to the tube. Herbicides were applied by a hand sprayer, and then the crop seeds of weed plants were drilled. Herbicide migration in the soil layer was estimated by inhibition of plant growth. The method was used for determination of migration of the herbicide Yalan (molinate). It was found that at a dose of 6 kg/ha the herbicide was retained in a 8-10 cm soil layer.

81-2195. Pen'kov, L. A.; Minenko, A. K. (All-Union Res. Inst. Sel. & Seed Prod. Veg. Crops, USSR) **Deistvie malorana na mikroflory dernovo-podzolistoi i poimennoi pochv. [Effect of maloran on microflora of soddy-podzolic and soddy-alluvial soils.]** *Khim. Sel'sk. Khoz.* 19(3): 57-60; 1981 (Russian).

The effect of the herbicide maloran (chlorbromuron) on the microflora of soddy-podzolic and soddy-alluvial soils was studied. Maloran was applied after carrot planting but before emergence at 1.5 kg/ha. Biological activity of maloran was studied in a 0-15 cm soil layer on days 10, 40 and 83 after application. Maloran was found to cause more inhibition of soil microflora in soddy-podzolic soil. A decrease of the nitrifying activity was recorded throughout the entire observation period. In soddy-alluvial soils, the decrease of nitrifying activity was recorded only on day 40 after herbicide application.

81-2196. Bourne, W. R. P. (Author address not given) **Toxic chemicals and seabirds.** *Mar. Pollut. Bull.* 12(4): 105-106; 1981.

Information on marine pollution in the Firth of Cycle and the Firth of Forth near the Irish Sea indicate that PCB contamination dropped to a minimum in both estuaries in 1975, but increased rapidly thereafter. DDE and dieldrin have not been detected recently. Mercury levels remain fairly stable, except for a sharp peak of twice the normal level in the Forth in 1975. Cadmium was also reported from both estuaries in 1977; levels were higher in the Forth. However, it is suggested that these results be re-examined. These findings resulted from the analysis of gannets, and proved to be more variable than earlier findings from study of other, less mobile, species with a more constant diet.

81-2197. Holden, A. V. (Author address not given) **Organochlorines - an overview.** *Mar. Pollut. Bull.* 12(4): 110-115; 1981.

High concentrations of DDT in the tissues of some fish indicate that low concentrations of DDT have spread throughout the atmosphere over long distances following the broad-scale use of the chemical in agriculture and forestry. Technological advances have been made which allow monitoring a wide range of materials for various purposes. However, if the data gathered is not reliable the danger of making incorrect decisions exists. It is suggested that many compounds, particularly organochlorines, are probably still being overlooked in environmental samples. Toxaphene has been identified in seals in the Baltic. It is not a commonly used pesticide in western Europe, but it is assumed that some countries in that area have been using the chemical. Extensive monitoring of the marine environment is recommended for identification of areas of high contamination, indicating whether food from the sea is fit for human consumption, measuring effectiveness of control measures, prediction of species effects, observation of trends, study of metabolism and degradation of specific contaminants, identification of new contamination, and comparison of contamination levels in different areas.

81-2198. Denton, G. R. W.; Breck, W. G. (Dep. Mar. Biol., Sch. Biol. Sci., James Cook Univ. North Queensland, Douglas, Townsville, Australia) **Mercury in tropical marine organisms from North Queensland.** *Mar. Pollut. Bull.* 12(4): 116-121; 1981 (69 references).

A variety of fish and invertebrates and 2 dugongs were taken from coastal water of Townsville on the North East coast of Australia. Levels of mercury contamination were investigated in these species. The highest levels were usually found in the fish; 50% of the sharks examined had muscle concentrations > 0.5 μg/g wet wt. A positive correlation was noted between muscle levels and body length in sharks. Of the teleosts examined, 70% contained < 0.2 μg/g mercury in their muscle tissue, and only 7% were above the 0.5 μg/g level. Teleost liver concentrations of mercury were significantly positively correlated with muscle levels. Among the invertebrates, the cephalopod molluscs contained the highest levels; none exceeded 0.5 μg/g. Dugong mercury levels were extremely low compared with most reported values for other marine mammals. It was concluded that the area contained mercury levels slightly above those considered normal for a non-contaminated marine environment.

81-2199. Anonymous **Herbicides - gone with the wind.** *New Sci.* 90(1251): 304-305; 1981.

Spraydrift damage was extremely severe in the Vale of Evesham in Worcester. The situation was considered most serious since the damage occurred after cereals were sprayed with herbicides and growth regulators. Nippled tomatoes, lettuces without a heart, tainted black-currants, and roe flowers with bud drop, were examples of the damage. In some cases plants growing inside greenhouses were actually damaged. The ester formulations of some widely used herbicides are so volatile that they may vaporize from leaf surfaces days after their application so there is no way to predict the direction of the spray. A campaign is now underway to review how pesticide products are labeled. There are no approved standard phrases for product labels concerning the dangers of spray or vapor drift. Controlled droplet application techniques now being developed may, by careful control of droplet size, improve the uniformity of deposition of pesticides on target crops and reduce the risk of drift. The local banning of certain herbicides is being sought.

81-2200. Fleming, W. J.; Cromartie, E. (Patuxent Wildl. Res. Cent., US Fish & Wildl. Serv., Laurel, MD 20811) **DDT residues in young wood ducks *(Aix sponsa)* near a former DDT manufacturing plant.** *Pestic. Monit. J.* 14(4): 115-118; 1981 (8 references).

Breast muscle DDE residues were as high as 5.8 ppm wet wt basis and 280 ppm lipid-wt basis in young wood ducks *(Aix sponsa)* collected on Wheeler National Wildlife Refuge near a former DDT manufacturing plant in northern Alabama. The average DDE residues in wood ducks collected nearest the plant were 46 times background levels 74 km from the plant. (Author abstract by permission)

81-2201. Lunsford, C. A. (Div. Ecol. Stud., Virginia State Water Control Broad, Richmond, VA 23230) **Kepone distribution in the water column of the James River estuary – 1976-78.** *Pestic. Monit. J.* 14(4): 119-124; 1981 (16 references).

Concentrations of Kepone (chlordecone) residues in water collected from the James River Estuary in 1976-78 ranged from 0 to 100 ppb. The majority of water samples collected showed no detectable residues. Kepone concen-

trations at the surface and bottom of the water column were similar. Water column residues varied according to seasonal and spatial differences. Levels peaked during the summer months and averaged higher in the middle of the estuary. Residues in the water were 1-5 orders of magnitude lower than reported residues in James River bed sediments. There was a significant correlation between water column and underlying bed sediment residues. (Author abstract by permission)

81-2202. Ohlendorf, H. M.; Swineford, D. M.; Locke, L. N. (Div. Wild. & Fish. Biol., US Fish & Wildl. Serv., Univ. California, Davis, CA 95616) **Organochlorine residues and mortality of herons.** *Pestic. Monit. J.* 14(4): 125-135; 1981 (20 references).

Since 1966, 72 herons found dead or moribund in the field have been analyzed for organochlorine chemicals. In addition, 36 herons were obtained through systematic collections, and carcasses were analyzed to determine sublethal exposure to organochlorines. Brains of birds found dead or moribund were analyzed to determine whether the birds had died of organochlorine poisoning. Residues of DDE were found most frequently (96 of 105 carcasses analyzed), PCBs were second (detected in 90 carcasses), and dieldrin and TDE (detected in 37 and 35 carcasses, respectively) were about equal as third and fourth most frequent. Endrin, mirex, toxaphene, and hexachlorobenzene (HCB) were found least often (8, 9, 9, and 9 carcasses, respectively). At least 1 organochlorine was found in each carcass, except for 6 heron chicks found dead in a Maryland heronry. DDE and PCBs were present in highest concentrations; they exceeded 100 ppm in two birds each. Organochlorine concentrations were almost always higher in adult herons than in immature birds. All birds that had hazardous or lethal concentrations in the brain were adults, and most were great blue herons *(Ardea herodias)*. Dieldrin was the chemical most often considered responsible for death. Herons died of suspected DDT and dieldrin poisoning years after the chemicals were banned in the United States. More than 20 percent of the herons found dead or moribund had lethal or hazardous concentrations of organochlorines in the brain. (Author abstract by permission)

81-2203. Schmitt, C. J.; Ludke, J. L.; Walsh, D. F. (Columbia Natl. Fish. Res. Lab., US Fish & Wildl. Serv., Columbia, MO 65201) **Organochlorine residues in fish: National Pesticide Monitoring Program, 1970-74.** *Pestic. Monit. J.* 14(4): 136-206; 1981 (36 references).

As part of the National Pesticide Monitoring Program, the U.S. Fish and Wildlife Service analyzed organochlorine contaminant residues in fish samples collected from about 100 stations each year from 1970 to 1974. During this period, mean residues of DDT and its metabolites declined nationally but remained widespread, and high concentrations continued to be present in areas where DDT use was extensive. Results of interlaboratory crosscheck analyses supported these conclusions, despite interpretation problems posed by intercompound analytical interferences in 1970 and 1971. Temporal trends in PCB residues were less obvious. Highest PCB residues were found in the industrialized areas of the Northwest and Midwest, and traces were present at most stations. Dieldrin and endrin residues remained essentially unchanged during this period; dieldrin residues were widespread and were highest in Hawaii and in areas of the Midwest where aldrin was used extensively. Toxaphene occurrence increased; it was formerly found only in fish from streams draining cotton-farming regions, but residues were detected in 1974 samples from other areas. According to the recommendation of the National Academy of Sciences' Water Quality Criteria, organochlorine residues in freshwater fish may have represented a hazard to piscivorous fish and wildlife at 71% of the stations sampled in 1970 and 66% in 1974. (Author abstract by permission)

81-2204. Pemberton, J. M. (Dep. Microbiol., Univ. Queensland, St. Lucia, Queensland 4067, Australia) **Genetic engineering and biological detoxification of environmental pollutants.** *Residue Rev.* 78: 1-11; 1981 (20 references).

Many of the products and by-products of the chemical industry, used in both industry and agriculture, are complex synthetic molecules which appear to have no counterparts in nature. Methods for the disposal and detoxification of many of these compounds, which pose real and potential pollution problems, are either very unsatisfactory or nonexistent. Since microorganisms are the major degraders and recyclers of organic molecules in nature, their failure to degrade these novel compounds contributes significantly to the pollution problem. To overcome the inherent limitations in microorganisms, particularly bacteria, it is suggested *in vivo* and *in vitro* genetic engineering techniques be used to construct bacteria with novel degradative abilities. Pesticide degrading plasmids are considered. The occurrence of a transmissible plasmid conferring the ability to degrade the herbicide 2,4-D in the soil bacterium *Alcaligenes paradoxus* is discussed. (Author abstract by permission, modified)

81-2205. Gerstl, Z.; Yaron, B. (Div. Soil Residues Chem., Inst. Soils & Water, Agric. Res. Org., Bet Dagan, Israel) **Attapulgite-pesticide interactions.** *Residue Rev.* 78: 69-99; 1981 (68 references).

A review of the literature shows that pesticides from many different groups have been formulated with attapulgite and many different deactivators have been used such as glycols, tall oils, and ureas. Deactivation is usually accomplished by addition of a chemical which changes the surface acidity of the clay but evidence exists that the

mechanism is more directly connected to the surface water molecules. Deactivation can be accomplished by heating at elevated temperatures and decreasing moisture content and surface area, as has been found by diazinon. Surface reactions can occur on clays and the isomerization of parathion on attapulgites was presented as an example. The main factor affecting the reaction is the nature of the surface. A Ca-attapulgite was found to result in isomerization but an organo-attapulgite was unreactive under similar conditions. The mechanism proposed for the reaction depends on the configuration of adsorbed parathion molecules. The adsorptive capacity of attapulgite for pesticides from organic solvents as affected by preheating at elevated temperatures was found to change and was correlated to the surface area of the clays. The adsorption was found to occur on high- and low-energy sites, the ratio of one to another changing upon heating. Competition for adsorption sites by other adsorbates, such as benzene or water, alter not only the adsorptive capacity of the clay but the nature of the resulting isotherm. Release of adsorbed pesticides was shown to be related to the adsorptive capacity of the clay as well as the nature of the clay surface. The organo-attapulgite strongly held parathion in equilibrium studies, but leaching studies in both sorbing and nonsorbing media indicated that no differences could be observed among the various treatments. (Author abstract by permission, abridged)

81-2206. Heinisch, E. (Author address not given) **Oekologisch-oekonomische Wechselwirkungen bei der Anwendung von Pflanzenschutzmitteln und Mitteln zur Steuerung biologischer Prozesse. [Ecological-economical relationships of the use of pesticides and of agents regulating biological processes.]** *Sitzungsber. Akad. Wiss. DDR* (15): 53-62; 1980 (10 references) (German).

The ecological and economic aspects of the use of pesticides in general and of herbicides and growth regulators in particular are discussed, and statistical figures on the consumption of these products in East Germany and other countries are presented. Dinoseb and DNOC are no longer used due to their toxic effects and persistence. There has been a remarkable increase in the use of herbicides and growth regulators. The harmful ecological effects of the use of pesticides in large-scale agriculture employing industrial methods are often continued, complemented, and overlapped by similar harmful effects and consequences of other economic and social activities, but agriculture is usually the chief cause of these ecological effects.

81-2207. Anderson, J. P. E. (Sparte. Pflanzenschutz, Anwendungstech. CE Oekobiol., Bayer AG, D-5090 Leverkusen, BRD) **Soil moisture and the rates of biodegradation of diallate and triallate.** *Soil Biol. Biochem.* 13(2): 155-161; 1981 (19 references).

Parabrown soil samples were tumbled for 30 min in glass containers with enough Avadex or Avadex BW talcum powder to give final concentrations of 1 μg diallate or triallate/g soil. Talcum was used to give even distribution of the herbicides in the soil and had no measurable effect on the rates or routes of diallate or triallate dissipation. Soil water content influenced persistence of diallate and triallate. Under conditions of similar incubation, diallate was lost from the soil at 2-3 times the rate of triallate. The major routes of dissipation of these compounds were degradation and conversion to unextractable residues. The rates of loss of diallate and triallate from soil could not be described by first order kinetics. The size of microbial biomass in the soil directly influenced the rates of degradation of diallate and triallate. The water content influenced both the size and survival of the biomass and, therefore, indirectly influenced the degradation rates. The main physical factor influencing the rate of dissipation was adsorption. It was concluded that the basic potential of a soil to degrade diallate and triallate is the quantity of microbial biomass in the soil. The rate of degradation depends on the factors which influence the availability of the herbicides to the biomass.

81-2208. Smelt, J. H.; Leistra, M.; Dekker, A.; Schut, C. J. (Inst. Pestic. Res., NL-6709 Wageningen, The Netherlands) **Movement and conversion of ethoprophos in soil in winter. I. Measured concentration patterns and conversion rates.** *Soil Sci.* 131(4): 242-248; 1981 (9 references).

The nematicide ethoprophos (ethoprop) was mixed with the top 9 cm of soil columns taken from Wierum, Middenmeer, and Rolde, The Netherlands. These fields had previously been cropped with wheat, sugar beet, and annual lea, respectively. Percolation water was collected and parts of the columns were separated into layers at regular intervals. The layers were then analyzed for ethoprophos by gas-liquid chromatography. During winter there was a distinct movement of ethoprophos in the 2 loamy soils, however the nematicide remained in the top 30 cm. Mobility was comparatively low in the humus loamy sand soil. Ethoprophos could not be measured in the percolation water. By the end of April only 10-20% of the dose was left in the 2 loamy soils, while about 75% remained in the humus loamy sand soil. Substantial conversion of ethoprophos occurred in loamy soil at temperatures down to 2°C.

81-2209. Zandvoort, R.; Van den Born, G. W.; Braber, J. M.; Smelt, J. H. (Cent. Agrobiol. Res., CABO, NL-6700 AA Wageningen, The Netherlands) **Leaching of the herbicide bromacil after application on railroads in The Netherlands.** *Water Air Soil Pollut.* 13(3): 363-372; 1980 (10 references).

Studies were conducted to determine the levels of leaching of bromacil from application sites. The herbicide was applied along railroads at either 1.8 or 3.6 kg AI/ha

from 1972 through 1976. Samples were collected at regular intervals during this long term study. Samples were either removed by coring devices or, for leaching experiments, from prepared soil columns tested in the laboratory. Field tests indicated that the highest content was generally in the 10-20 cm layers. After 2 yr, bromacil had penetrated to a depth of 100 cm at concentrations less than 0.1 mg/kg. The results of laboratory studies indicated that only 34% of the recovered bromacil was found in soils removed from surface layers, and 74% was recovered from soils taken from deeper layers, indicating that the leaching rate is higher in surface soils. It appears that this herbicide could eventually leach into the ground water because of its low conversion rate.

See also 81-2101, 81-2104, 81-2105, 81-2106, 81-2107, 81-2112, 81-2130, 81-2217, 81-2230, 81-2232, 81-2233, 81-2234, 81-2249, 81-2273, 81-2274, 81-2275, 81-2276, 81-2277, 81-2278, 81-2283, 81-2321, 81-2342, 81-2343, 81-2346, 81-2347 *and* 81-2358.

81-2210. Yeager, C. C (Author address not given) **Pesticide regulation in the United States.** In: *Biodeterioration.* Oxley, T. A., Becker, G., and Allsopp, D., eds. (Pitman Publ. Ltd.: London): pp. 323-329; 1980.

Government regulations for pesticides in the United States are reviewed. The Federal Insecticide, Fungicide and Rodenticide Act (FIFRA) was enacted in 1947 and functioned adequately for about 25 yr. After this time, however, many new products were rapidly introduced and environmental damage became a public concern. To alleviate these concerns the Federal Environmental Pesticides Control Act (FEPCA) was passed in 1972. This act caused much confusion, however, and the number of new products approved diminished from thousands to a very few. EPA has subsequently prepared a series of forms which outline the data required, the various uses for the product, and the confidential formula for the product. These must be completed for registration and filed with the EPA. It is also possible to amend registrations or to apply for supplemental registration of distributors. Currently the pesticide registration process requires extensive overhaul.

81-2211. Houghton, E. R.; Cedar, F. J. (Pestic. Sect., Plant Prod. Div., Agric. Canada, Ottawa, Ontario, Canada) **Pesticide regulations in Canada.** In: *Biodeterioration.* Oxley, T. A., Becker, G. and Allsopp, D., eds. (Pitman Publ. Ltd.: London): pp. 331-333; 1980.

Pesticide regulations in Canada are reviewed. In 1969 the Pest Control Products Act was adopted. Legal pesticide maximum residue limits on food were established under the federal authority of the Food and Drugs Act. Pesticides currently undergoing research are exempt from this registration. If the research is confined to a single premise, owned or operated by the researcher, no regulatory procedures are required. Research carried out on premises not owned by the researcher must be approved. Devices that are in themselves instruments for the control of pests are exempt from the provisions of the Act unless they are described in Schedule I of the Regulations, which renders them subject to registration. Devices that are instruments to facilitate the use or application of a pesticide are subject to the PCP Act. Regulations pertaining to pesticidal ingredients in products whose primary purpose is other than pest control are also reviewed.

81-2212. Flipse, L. P. (Bur. Pestic., Wageningen, The Netherlands) **Pesticides legislation in The Netherlands. A general review.** In: *Biodeterioration.* Oxley, T. A., Becker, G. and Allsopp, D., eds. (Pitman Publ. Ltd.: London): pp. 335-337; 1980.

Pesticide legislation in The Netherlands began in 1947 when the principal aim was to protect farmers against the marketing of ineffective pesticides and against pesticides which were injurious to the crop. The Pesticides Act of 1962 had a wide scope and covered regulations concerning the marketing, sale, storage and use of all pesticides based on a proper registration and approval scheme. It also covered tolerance regulations for food. To be accepted for use, a pesticide has to have demonstrated efficacy for the purpose for which it is intended and the absence of undesirable side-effects. Procedures for authorization, supervision and inspection of pesticides in The Netherlands are described. No formal harmonization within the European Community has been achieved, although existing legislation in several European countries have many similarities.

81-2213. Lyre, H. (Biol. Bundesanst. Land & Fortwirtsch., Braunschweig, BRD) **Pesticide regulations in the Federal Republic of Germany.** In: *Biodeterioration.* Oxley, T. A., Becker, G. and Allsopp, D., eds. (Pitman Publ. Ltd.: London): pp. 339-340; 1980.

A concise review of pesticide regulations in the Federal Republic of Germany is presented. The Federal Biological Research Center for Agriculture and Forestry is primarily concerned with the approval and authorization of plant protection products and plant growth regulators. Authorization of plant protection products and growth regulators occurs through the Plant Protection Act of May 1968. These substances may not be imported or marketed until approved by the Federal Branch. Chemical data must be submitted which describes in detail the type of active ingredient, purity of the technical active ingredient, any isomers, and the nature and quantity of impurities. Data on physical and chemical properties are also required, as are toxicological data. These data are primarily evaluated by the agency, and its consent is a prerequisite for granting approval.

81-2214. Anonymous **Occupational disease and the kidney.** *Br. Med. J.* 282(6273): 1341; 1981 (8 references).

The role of occupational exposure to various substances in kidney disease is discussed. It is noted that the kidney is rarely damaged by these potentially toxic compounds. However, among the substances that are known to be toxic to the kidney are lead, cadmium, mercury and other heavy metals, carbon tetrachloride, toluene, silica dust, and the commonly used pesticides 2,4-D and paraquat. The latter can cause renal damage in animals and humans, but there is no evidence that they cause damage in human at normal levels of exposure. It is suggested that in the future environmental toxins may prove to be among the causes of some defined renal diseases which are currently of unknown etiology.

81-2215. Brokopp, C. D.; Wyatt, J. L.; Gabica, J. (Idaho Dep. Health & Welfare, Epidemiol. Stud. Program, Boise, ID 83720) **Dialkyl phosphates in urine samples from**

pesticide formulators exposed to disulfoton and phorate. *Bull. Environ. Contam. Toxicol.* 26(4): 524-529; 1981 (6 references).

Eleven employees of a pesticide formulating plant were examined. All formulators were males between ages 22 and 52. Eight had no prior occupational exposure to organophosphate insecticides. Urine specimens were collected each weekday morning from each formulator. The predominant alkyl phosphates found in urine during disulfoton formulation were diethyl phosphate (DEF), diethyl phosphorothiolate (DEPTh), and diethyl thiophosphate (DETP). The percentage of urine samples from 10 formulators who had DEP, DEPTh, and DETP above the threshold limits were 56, 34, and 19%, respectively. Diethyl dithiophosphate (DEDTP) exceeded threshold levels in only 11% or less of the samples analyzed. Of the 313 samples collected daily from 10 formulators during disulfoton formulation, 68% contained 1 or more alkyl phosphates above the threshold level. The range of diethyl phosphates in urine samples during disulfoton formulation were DEP (0.01-4.40 ppm), DETP (0.01-1.57 ppm), DEDTP (< 0.01-0.05 ppm), and DEPTH (< 0.01 to 0.55 ppm). Although elevated DEP, DETP, and DEPTH levels were identified in urine during disulfoton formulation, plasma and erythrocyte ChE levels showed no significant reduction.

81-2216. Shull, L. R.; Foss, M.; Anderson, C. R.; Feighner, K. (Dep. Dairy Sci., Michigan State Univ., East Lansing, MI 48824) **Usage patterns of chemically treated wood on Michigan dairy farms.** *Bull. Environ. Contam. Toxicol.* 26(4): 561-566; 1981 (5 references).

Several Michigan dairy farms were quarantined by state officials in 1977 due to possible overexposure of cattle to pentachlorophenol (PCP) treated wood. To evaluate the potential exposure of Michigan dairy cattle to wood preservatives a survey was carried out from 1977 to 1979. Of the 4734 farms that reported their type of housing facility, 61% indicated they used treated wood. PCP treated wood was used in 98% of the cases where treated wood was used. When results were cross-tabulated with the number of milking cows, fewer of the smaller farms reported one or more treated feed structures. The results indicate that the use of chemically-treated wood has widespread application on Michigan grade A dairy farms. While 51% of the farms were exercising necessary and/or proper usage of treated wood, 35% had one or more unnecessary and/or improper usage such as for feed structures, calf pens, or rafters. It is suggested that these uses could result in overexposure of animals to preservatives that are not required for wood protection. It is recommended that an information campaign be directed on the proper and safe use of chemically-preserved wood on livestock farms.

81-2217. Jamieson, D. (Thames Water, Reading, Berkshire RG1 8DB, England) **Toxic materials and industrial effluents. Ultimate disposal to land.** *Chem. Ind. (London)* (8): 267-271; 1981 (12 references).

Toxic materials in industrial effluents are discussed with an emphasis on land disposal. The beneficial uses of sludge are reviewed. They include soil fertilization and conditioning. However, there are some potential hazards such as pathogens, heavy metals and persistent organic chemicals. The range of levels of selected organochlorine compounds found in sewage sludge were 0-16.2 mg aldrin/kg, 0.03-2.2 mg dieldrin/kg, 0-352 mg PCBs/kg, 3-32 mg chlordane/kg, and 0.1-1.1 mg DDT/kg. Methods of improving sludge disposal and possible future legislation are discussed.

81-2218. Brusick, D. J.; Matheson, D. W.; Jagannath, D. R. (Litton Bionetics, Kensington, MD 20795) **Commercial screening of environmental chemicals.** In: *Chemical Mutagens. Principles and Methods for Their Detection.* de Serres, F. J. and Hollaender, A., eds. (Plenum Press: NY): 6(CH04): 81-107; 1980 (54 references).

Increasing costs of long-term tests for the screening of environmental chemicals led to development of short-term procedures that are highly predictive when employed as a battery. Information gathered from these short term tests which indicate that the chronic carcinogenicity assay would fail, would facilitate a decision to abandon further testing of the particular compound before extremely large expenditures would be made. Assays such as the Ames test, the various tests measuring malignant transformation and DNA repair assays are excellent illustrations of how fundamental research, seeking to elucidate the mechanisms involved in the induction of neoplasia and DNA repair pathways, have led to techniques currently employed to identify chemicals with potential chronic toxicity for humans. The use of these assay systems for identifying genotoxic substances, to influence public health and safety standards, and to stimulate management decisions concerning chemical development of the tested product is encouraged. Requirements include necessary facilities for chemical tracking, biohazard hoods and air filtration systems, laboratory access and designated work areas, data management and control, preparation of reports, and adequate procedures for storage and waste disposal. Legal operation requirements are also discussed.

81-2219. Poklis, A.; Gantner, G. E. (Div. Forensic & Environ. Pathol., Sch. Med., St. Louis Univ., St. Louis, MO 63104) **Drug deaths in St. Louis City and County: a brief survey, 1977-1979.** *Clin. Toxicol.* 18(2): 141-147; 1981 (15 references).

The vast majority of drug deaths in St. Louis City and County through 1977-1979 were of adults who ingested multiple drugs with suicidal intent. In this 3-yr survey, 7 deaths were due to accidental overdose of ethanol, 7 due to over-the-counter products or laboratory reagents, 8 from

classic poisons (including the pesticide, diazinon) and only 8 from drug abuse. The remaining 117 deaths (80%) resulted from ingestion of legally obtained prescription drugs. Sixty-two percent of all deaths were due to multiple drug administration. Only one child was fatally poisoned. Barbiturates, benzodiazepines, ethanol, propoxyphene, and tricyclic antidepressants were the most common agents encountered. (Author abstract by permission)

81-2220. Van den Bosch, R. (Author address not given) **The rape of EPA.** *Ecologist* 10(3): 80; 1980.

Difficulties which have confronted the Environmental Protection Agency in its attempts to carry out its mandate are described. The power of the American chemical industry, and the pressure tactics used against the EPA are discussed. A major effort of those supporting the use of pesticides has been passage of a bill, HR 8841, which severely compromises EPA's pesticide-regulating capacity. HR 8841 was passed in a modified form, and gives the Secretary of Agriculture veto power over pesticide regulation and cancellation decisions made by the EPA.

81-2221. McIntyre, A. E.; Perry, R.; Lester, J. N. (Public Health Eng. Lab., Civ. Eng. Dep., Imperial Coll., London SW7 2AZ, England) **The behaviour of polychlorinated biphenyls and organochlorine insecticides in primary mechanical wastewater treatment.** *Environ. Pollut. Ser. B* 2(3): 223-233; 1981 (24 references).

Samples were collected from the New Works Extension to Sandford Sewage Treatment Works in Oxford, England. This treatment facility normally treats 25 million l/day of raw sewage containing about 18% by volume of industrial effluent. Significant differences were noted in the recovery of Arochlor 1260 and *p,p'*-DDE from the subsamples diluted to various suspended solids concentrations. Recoveries of PCB decreased from 20.3 ng at 247 mg/l suspended solids to 13.7 ng at 100 mg/l suspended solids for Arochlor 1260 and from 6.8 ng for DDE at the upper and lower suspended solids concentrations, respectively. γ-HCH (γ-BHC; lindane) and dieldrin displayed a different trend, with no significant variation over the range of suspended solids concentrations. It was determined that the primary sedimentation process employed at the plant removed about 50% of the PCB and dieldrin, and more than 33% of the DDE, from the raw sewage. PCB and organochlorine concentrations in the primary sludges were in the μg/l range. The method of disposal of sludges, to agricultural land, in landfills or at sea, may result in the introduction of these persistent organic materials into food chains where biomagnification may occur.

81-2222. Dorofeev, V. M.; Gavrichenko, A. I.; Zolotnikova, G. P. (Inst. Occup. Saf. Agric., Orel, USSR) **Nekotorye aktual'nye voprosy okhrany truda zhenshchin v teplitsakh pri primenenii pestitsidov. [Occupational safety of women exposed to pesticides during work in hothouses.]** *Gig. Tr. Prof. Zabol.* (3): 22-24; 1981 (5 references) (Russian).

Various aspects of occupational safety for women exposed to pesticides during work in hothouses are discussed. A total of 50 different pesticides are used for plant protection in hothouses (36% organophosphorus compounds, 28% carbamates and phenol derivatives, 18% organochlorine compounds, and 18% other compounds). About 50% of pesticides have marked skin-resorptive and local-irritating effects. Elevated temperature and relative humidity in the hothouses can enhance the toxic effect of pesticides. Pesticides with short degradation times are recommended for hothouse use. A ban of the use of pesticides with skin-resorptive activity, periodic physical examination of female workers, and the use of biologically active compounds for prevention of chronic pesticide poisoning are also recommended.

81-2223. Anonymous **Control of pesticides.** *Int. Dig. Health Legis.* 31(4): 763-764; 1980.

An amendment is presented to the Canadian Pest Control Products Regulations. Certain pesticides are added to a schedule of pesticides which are exempted from registration provided that certain conditions are fulfilled. These are cleansers containing chlorinated compounds in dry formulations for household use and which are represented as general disinfectants; and bleaches containing sodium hypochlorite for household use which are represented as general disinfectants.

81-2224. Anonymous **Control of pesticides.** *Int. Dig. Health Legis.* 31(4): 800-802; 1980.

The principal provisions of Denmark's September 1980 order on the control of pesticides is presented. All pesticides which must be approved by the Environment Board prior to sale or use are listed. Pesticides are to be classified according to the (European) Community danger classifications (very toxic, toxic, or harmful). Pesticides must meet specified packaging and labeling requirements. Very toxic pesticides may be sold only by authorized persons and bought only by licensed persons. A record must be kept by the seller of all transactions involving very toxic pesticides. Required conditions for storage are also described. Very toxic pesticides may only be used by licensed persons. Toxic pesticides may be used only by licensed persons, persons having a commercial interest, or their assistants.

81-2225. Anonymous **Control of toxic substances: provisions relating to dioxins.** *Int. Dig. Health Legis.* 31(4): 884-885; 1980.

An Act (Public Law 96-151) to amend title 38, United States Code, is presented. The Act requires the Veterans Administration to conduct an epidemiological study regarding veterans exposure to Agent Orange (2,4-D + 2,4,5-T). The amendment also requires the Veterans Administration to carry out a comprehensive review and scientific analysis of the literature regarding possible long-term effects of dioxin exposure.

81-2226. Anonymous **Control of marine pollution: protocol applicable to land-based sources.** *Int. Dig. Health Legis.* 31(4): 950-958; 1980.

The Protocol for the Protection of the Mediterranean Sea against Pollution from Land-Based Sources is presented. The document, prepared in Athens in May of 1980, contains 16 articles and 3 annexes, which outline the measures agreed upon to protect the Mediterranean from pollution caused by discharges from rivers, coastal establishments or outfalls, or emanating from any other land-based sources. The substances to be controlled are listed and include organohalogen, organophosphorus, and organotin compounds, mercury and mercury compounds, cadmium and cadmium compounds, and substances having proven carcinogenic, teratogenic or mutagenic properties. Among the substances to be strictly limited are biocides and their derivatives not covered above. A framework for implementation of the programs, including coordination of research groups and exchange of information, is presented.

81-2227. Kahn, E. (Calif. State Dep. Health Serv., Berkeley, CA 94704) **Epidemiology of field re-entry poisoning.** *J. Environ. Pathol. Toxicol.* 4(5-6): 323-330; 1980 (13 references).

Two studies which deal with pesticide residue-related illness among field workers in California are reviewed. These studies were significantly different from each other, and suggest that the number of officially reported cases is only a small fraction of the actual number of poisonings that occur. One study demonstrated an almost total ignorance on the part of the workers regarding Workers' Compensation. In September, 1976, the largest single episode of field worker pesticide poisoning occurred in Madera County in California's Central Valley. A total of 118 workers became ill and were treated by physicians; several workers were hospitalized. It is suggested that the diagnosis was obvious and known to all the doctors treating the cases and that although there is a mandatory reporting system in California, only 6 cases were treated and reported as workers' compensation cases. Since 1971 California has had re-entry safety time intervals. In the ensueing years, attempts have been made to improve the data on which these re-entry intervals are based.

81-2228. Umarova, D. T. (Dep. Microbiol. Immunol. & Introd. Virol, Middle Asian Med. Mediatric Inst., Tashkent, USSR) **Fagotsitoz u bol'nykh khronicheskim enterokolitom, rabotayushchikh s yadokhimikatami. [Phagocytosis in chronic enterocolitis patients dealing with pesticides.]** *Laboratornoe Delo* (3): 171-172; 1981 (8 references) (Russian).

The effect of pesticides on phagocytic activity of leukocytes was studied in 460 patients with chronic colitis who had an occupational exposure to agricultural chemicals. The patients exposed to pesticides had significantly reduced phagocytic activity; activity was 5.8-13.3%, compared with 39.2-48.1% in the patients with enterocolitis who did not have an exposure to pesticides and 63.1-85.4% in healthy controls. Patients also had a significantly reduced phagocytic index (0.52-1.0% compared with 2.2-3.7% and 5.7-6.3%) and significantly reduced completeness of phagocytosis (5.1-10.2%, compared with 36.0-46.0% and 66.1-70.5%).

81-2229. England, J. F. (143 Katoomba St., Katoomba, New South Wales 2780, Australia) **Herbicides and coronary ectasia.** *Med. J. Aust.* 1(3): 140; 1981 (3 references).

An apparent clustering of coronary artery ectasia was noted on a retrospective review of young males surviving myocardial infarction. The abnormality has been associated with prolonged exposure to herbicide sprays containing 2,4,5-T and its associated contaminant TCDD (dioxin). An increase in coronary heart disease incidence has been suspected in chemical workers accidentally exposed to 2,4,5-T. Two cases of myocardial infarction after use of 2,4,5-T blackberry sprays are presented briefly. It is suggested that large teaching hospitals would be in a good position to review coronary angiograms for this rare angiographic abnormality and determine whether there is any associated chemical exposure.

81-2230. Pimentel, D.; Pimentel, S. (Coll. Agric. & Life Sci., Cornell Univ., Ithaca, NY) **Ecological aspects of agricultural policy.** *Nat. Resour. J.* 20(3): 555-585; 1980 (183 references).

Two policy areas related to food production are considered: land conservation and pesticide use. Agricultural and ecological implications of some current pest control policies are discussed. Benefits and costs of pesticide use are weighed. About 800 million pounds of pesticides are applied annually in agriculture in the US. Pesticide usage continues to increase. The dollar loss to the nation from eliminating pesticide use would be considerable, an estimated $8.7 billion loss in crops. The impact of pesticides on the total environment and on public health is significant. The effects are varied and complex and often ignored when total assessments of benefits and costs are calculated. Pesticides have influenced the structure and function of ecosystems, altered natural communities, and reduced species population numbers in certain areas. Normal behavior in animal groups has been changed. Pest control policies are reviewed including cur-

rent government policies and those of the past several years.

81-2231. Marshall, M. F. (Author address not given) **The toxaphene controversy: aggressive environmental litigation comes to South Dakota.** *S. D. Law Rev.* 25(3): 580-596; 1980 (141 references).

This legal comment offers a brief summary of the Federal Environmental Pesticide Control Act's registration and cancellation procedures, an analysis of the Audubon case, and suggests an amendment to the US EPA regulations that would make the agency more receptive to public input in the exemption process and more responsive to a national environmental policy. The Audubon case highlighted problems encountered in the special exemption procedure followed by the EPA. In 1978, the South Dakota Department of Agriculture obtained a crisis exemption to control an outbreak of grasshoppers in epidemic proportions on rangeland in western South Dakota. The plan called for the use of toxaphene. The dangers of this chemical caused concerned individuals to attempt to have the exemption reversed. A temporary restraining order was issued, based on the courts interpretations of applicable federal laws and regulations. Before a permanent disposition of the case was rendered, however, the EPA cancelled the exemption for the use of toxaphene.

81-2232. Lohs, K. (Author address not given) **Die Stellung der chemischen Toxikologie in der Unweltforschung. [The place of chemical toxicology in environmental research.]** *Sitzungsber. Akad. Wiss. DDR* (5): 65-75; 1980 (11 references) (German).

Recent problems of environmental and hygienic toxicology are discussed. When used properly pesticides are not actually hazardous for the end consumer of agricultural products, but they can be very toxic when used inappropriately. The use of certain pesticides, such as DDT, has been either banned or strongly restricted in the light of recent toxicological and hygienic findings. Some pesticides accumulate in the body, and these may contain or give rise to toxic by-products, such as dioxin contaminating chlorophenols. The synergistic relationships of pesticide residues with other environmental chemicals are not sufficiently clarified. It is impossible to rule out the hazard of late sequelae of pesticide residues even in the ppb range. It is impossible at present to identify all metabolites of pesticides in the body, and very little is known on the possible interactions of these metabolites with other endogenous metabolites.

81-2233. Lohs, K. (Author address not given) **Umwelttoxikologische Bewertung chemischer Erzeugnisse und ihrer Abprodukte. [Environmental toxicological of chemical products and their byproducts.]** *Sitzungsber. Akad. Wiss. DDR* (15): 5-20; 1980 (6 references) (German).

General problems of toxic chemicals in the environment are discussed. Essential questions concerning the action mechanism, metabolism, and late sequelae of halogenated hydrocarbons, such as DDT, polychlorinated biphenyls, and of other pesticides (2,4-D and 2,4,5-T) have not yet been elucidated. New environmental toxicological problems have emerged recently, such as the possible formation of dioxins in connection with the use of aromatic organochlorine compounds. These dioxins have long-term effects in the biosphere, are teratogenic, and also possibly mutagenic and carcinogenic. These recent discoveries have led to a reevaluation of numerous aromatic organochlorine compounds.

81-2234. Engst, R. (Author address not given) **Schadstoffe in der menschlichen Ernahrung (Umwelt) und ihre toxikologische Bewertung. Umwelt und Umweltschutz. [Toxic substances in human diet (environment) and their toxicological assessment. Environment and environmental protection]** *Sitzungsber. Akad. Wiss. DDR* (15): 39-52; 1980 (27 references) (German).

Studies on toxic substances (including pesticides) in human diet are reviewed. In spite of the ban on DDT in East Germany, the average DDT level in adipose tissue in the population is 6-7 mg/kg. This level was 13-14 mg/kg during the period of intensive use of this pesticide, 1967-1969. DDT and polychlorinated biphenyl levels have also reduced considerably in human milk fat from the 1969-1970 levels. Data on the LD50 values of parathion, DNOC, lindane, and DDT for humans and rats are presented. Also reviewed are the toxification and detoxification metabolism of BHC and a comparison of the toxicities of DDT, dieldrin, parathion, dimethoate, malathion, thiram, chlorpropham, carbaryl and captan after oral or ip administration.

81-2235. Anonymous **Lindane activities.** *Vet. Hum. Toxicol.* 23(1): 66; 1981.

It is reported that the FIFRA Scientific Advisory Panel has recommended the immediate cancellation of the following uses of lindane: household uses in treated shelf paper and floor waxes; flea collars, and dog dusts and shampoos; and homeowners ornamental use. Lindane veterinary preparations should be classified for restricted use by veterinarians only. Since there are no substitutes for lindane in control of scabies, bark and powder beetles, or seed treatment for wireworms, the panel recommends that these uses be retained. The panel states that lindane can

produce central nervous system effects after oral and dermal ingestion, is a weak animal carcinogen, may possess a low degree of fetotoxicity, and may disrupt reproductive processes.

See also 81-2106, 81-2108, 81-2109, 81-2112, 31-2124, 81-2131, 81-2132, 81-2144, 81-2148, 81-2149, 81-2150, 81-2151, 81-2152, 81-2153, 81-2154, 81-2155, 81-2156, 81-2157, 81-2158, 81-2159, 81-2160, 81-2161, 81-2162, 81-2163, 81-2164, 81-2165, 81-2166, 81-2167, 81-2168, 81-2169, 81-2170, 81-2171, 81-2172, 81-2173, 81-2174, 81-2175, 81-2176, 81-2177, 81-2180, 81-2188, 81-2199, 81-2206, 81-2281, 81-2330, 81-2340 *and* 81-2346.

81-2236. Boehme, G.; Schoenfeld, P.; Kuester, U.; Kunz, W.; Lyr, H. (Physiol. Chem. Inst., Med. Acad. Magdeburg, DDR-3010 Magdeburg, DDR) **The multifunctional actions of β-thujaplicin on the oxidative energy transformations as a consequence of its lipophilic and chelating properties.** *Acta Biol. Med. Ger.* 39(11-12): 1153-1163; 1980 (36 references).

The various effects of the fungicide β-thujaplicin on the oxidative energy transformation by a common mechanism, using isolated rat liver mitochondria as a model system, are elucidated. Succinate plus rotenone was used as substrate. The mechanism of strong inhibition of active respiration by β-thujaplicin was investigated. The possibilities included inhibition of either the transport processes across the inner mitochondrial membrane for inorganic phosphate, adenine nucleotides, or succinate; the electron flux along the respiratory chain; or the mitochondrial ATPase. Remarkable inhibition of P*i* transport or translocation of adenine nucleotides was not observed. Effective suppression of the DNP-induced ATPase by β-thujaplicin, however, did explain the pronounced inhibition of active respiration. Impaired succinate transport and partial inhibition of the terminal respiratory chain at the level of cytochrome oxidase contributed to less marked inhibition of uncoupled respiration. The ability of β-thujaplicin to extract mitochondrial magnesium and the prevention of the effects of β-thujaplicin by an excess of magnesium in the medium suggest a common mode of action of β-thujaplicin as a lipophilic chelator of magnesium ions and other divalent cations.

81-2237. Pons, R.; Pussard, M. (Stn. Rech. Faune Sol, INRA, F-21034 Dijon, France) **Action des herbicides sur les amibes libres *(Rhizopoda, Protozoa)*. Etude preliminaire. [Action of herbicides on free-living Amoebae (Rhizopoda, Protozoa). Preliminary study.]** *Acta Ecol.* 1(1): 15-20; 1980 (27 references) (French).

The effects of siduron, neburon, diuron, 2,4-D, atrazine and DNOC on the multiplication of 23 strains of free-living Amoebae were studied in monoxenic agar cultures. Siduron (1.5-150 mg/l), neburon (1-5 mg/l), diuron (8.5-42 mg/l), and 2,4-D (28-84 mg/l) did not affect the growth of the test organisms. Atrazine (40 and 70 mg/l) inhibited the growth of *G. delicatula* and *N. gruberi* 113/1. DNOC (10-250 mg/l) inhibited the growth of all species at the highest concentration, and some Amoebae were susceptible even at the lowest concentration. The most resistant strains belong to the genera *Saccamoeba* and *Acanthamoeba.*

81-2238. Mahendru, V. K.; Agarwal, R. (Dep. Zool., Univ. Gorakhpur, Gorakhpur, India) **Changes in carbohydrate metabolism in various aspects of the snail, *Lymnaea acuminata*, following exposure to trichlorfon.** *Acta Pharmacol. Toxicol.* 48(5): 377-381; 1981 (19 references).

Groups of 40 adult *Lymnaea acuminata* were collected from local ponds and kept in aerated aquaria containing 2 *l* of dechlorinated tap water. Experimental groups were exposed to trichlorfon at 10 and 20 mg AI/l for 24 and 48 hr. Oxygen consumption declined in all four tissues (hepatopancreas, mantle, intestine and foot) studied of exposed animals. Maximum reductions of 43% were noted in the mantle, 46% in the intestine, 53% in the hepatopancreas, and 56% in the foot, following treatment with 20 mg/l for 48 hr. No exposure for 7 days after animals were exposed to the pesticide for 48 hr resulted in different responses from different tissues. In the mantle there was a significant increase in oxygen consumption, in the hepatopancreas and intestine there were significantly decreased oxygen levels present at the end of 48 hr of treatment. The foot did not register any significant change. Decreases in the glycogen content and increases in the concentrations of lactic acid and reducing sugars were also noted for all tissues. It was concluded that the toxicity of trichlorfon may not only be caused by the anticholinesterase activity effect, but may also be due to its effect on other enzyme systems.

81-2239. Eckenhausen, F. W.; Beynon, K. I.; Elgar, K. E. (Shell Toxicol. Lab., Sittingbourne Res. Cent., Shell Res. Ltd., Sittingbourne, Kent ME9 8AG, England) **Organochlorine pesticide concentrations in perinatal samples from mothers and babies.** *Arch. Environ. Health* 36(2): 81-92; 1981 (38 references).

Samples were obtained from Dutch mothers and their babies throughout the perinatal period and analyzed by gas-liquid chromatography with electron-capture detection for a range of organochlorine pesticides. Organochlorine concentrations in the blood of breast or bottle-fed babies were not significantly different. Differences in organochlorine concentrations in blood between mothers who had slimmed and those who had not were small, but it must be noted that there were few slimming mothers in the sample. Twelve to 21% and 36-61% of the estimated daily intake of dieldrin and DDT, respectively, by mothers may be eliminated by lactation. The placenta restricts the transmission of organochlorine pesticides to the fetus to some extent. The very low concentrations of organochlorine in fetal blood prevented a study of the comparative metabolism in mothers and babies. (Author abstract by permission)

81-2240. Smith, L. L.; Wyatt, I. (Cent. Toxicol. Lab., Imp. Chem. Ind. Ltd., Alderley Park, Cheshire SK10 4TJ, England) **The accumulation of putrescine into slices of rat lung and brain and its relationship to the accumulation of paraquat.** *Biochem. Pharmacol.* 30(10): 1053-1058; 1981 (19 references).

The diamine putrescine inhibits accumulation of the herbicide paraquat into slices of rat lung. Putrescine was also shown to be accumulated into rat lung slices by an

uptake process which obeyed saturation kinetics. The apparent K_m for the process was 7 μM with a V_{max} of 330 nmol/g wet wt of lung/hr. The uptake of putrescine was enhanced when the slices were incubated in sodium deficient medium and was inhibited by iodoacetate (1 mM) together with KCN (1 mM), rotenone (100 μM), and by paraquat. Putrescine was not accumulated by slices of liver, kidney, heart or spleen to concentrations much above that in the medium. It was accumulated however by a KCN sensitive process into brain slices, although the accumulation was less than that which occurred in lung slices. Lung slices taken from rats given an amount of paraquat known to damage both type I and type II lung alveolar epithelial cells were less able to accumulate putrescine or paraquat than lung slices taken from control rats. This reduction in uptake was similar for both compounds. These data have led us to conclude that the process in the lung and brain which accumulates paraquat is that which is normally responsible for the uptake of putrescine in particular and diamines in general, and it is the alveolar type I and type II cells of the lung which process a receptor for the active uptake of the diamine putrescine. (Author abstract by permission)

81-2241. Sturdik, E.; Drobnica, L. (Dep. Microbiol. & Biochem., Slovak Polytech. Univ., CS-88037 Bratislava, Czechoslovakia) **Inhibition of glycolysis in Ehrlich ascites carcinoma cells with dichlofluanid.** *Biologia (Bratislava)* 35(9): 657-665; 1980 (10 references).

The inhibition of glycolysis by the fungicide dichlofluanid was studied in Ehrlich ascites carcinoma (EAC) cells, which served as a model of mammalian cells. When EAC cells were incubated in Krebs-Ringer phosphate medium with glucose, dichlofluanid caused the inhibition of glucose consumption. This led to increased incorporation of ^{14}C-adenine and ^{14}C-valine into corresponding macromolecules in EAC cells. The inhibition of glycolysis was caused by the inactivation of the enzymes glyceraldehyde-3-phosphate dehydrogenase, hexokinase, and 6-phosphofructokinase by the chemical modification of their essential thiol groups.

81-2242. Gardner, W. S.; Miller, W. H.,; Imlay, M. J. (Columbia Natl. Fish. Res. Lab., US Fish & Wildl. Serv., Columbia, MO 65201) **Free amino acids in mantle tissues of the bivalve *Amblema plicata*: possible relation to environmental stress.** *Bull. Environ. Contam. Toxicol.* 26(1): 157-162; 1981 (20 references).

Specimens of *A. plicata* 6 to 14.5 cm long were sampled manually from 4 streams in Missouri. The mussels were collected from Cedar Creek and Gasconade River. Cedar Creek has a history of exposure to acid coal mine drainage, whereas Gasconade River is a clear, relatively unpolluted Ozark stream containing diverse biological populations. Free amino acid levels in mantle tissues were significantly higher in mussels from Cedar Creek than in those from Gasconade River. Increased amino acid levels in mantle tissues of *A. plicata* from Cedar Creek over those from Gasconade River were assumed to be due to stress from acid mine drainage. It is suggested that free amino acid levels in mantle tissues of *A. plicata* may also be increased if the animals are exposed to other types of contaminants. Mussels were then sampled from the Big and Bourbeuse Rivers. The middle section of Big River is located adjacent to lead mining sites. The Bourbeause River is located in an agricultural basin, and contains higher levels of suspended matter than the Big River; possible organic contamination by pesticides is also suggested. Significantly higher free amino acid concentrations were found in the metal-contaminated Big River mussels than in the Bourbeuse River controls.

81-2243. Hattula, M. L.; Wasenius, V. M.; Reunanen, H.; Arstila, A. U. (Dep. Cell Biol., Univ. Jyvaskyla, SF-40100 Jyvaskyla 10, Finland) **Acute toxicity of some chlorinated phenols, catechols, and cresols to trout.** *Bull. Environ. Contam. Toxicol.* 26(3): 295-298; 1981 (14 references).

The acute toxicities of 2,4-dichlorophenol, 2,6-dichlorophenol, 2,3,5-trichlorophenol, 2,4,5-trichlorophenol, 2,3,4,6-tetrachlorophenol, pentachlorophenol (PCP), 3,5-dichlorocatechol, 4,5-dichlorocatechol, 3,4,5,6-tetrachlorocatechol, 5-chloro- 3-methylcatechol, 3-chloro-*o*-cresol, 4-chloro-*o*-cresol, and 4-chloro-*m*-cresol to trout were determined. The lowest lethal concentration of the compounds studies was 0.20 ppm caused by PCP, tetrachloro- and trichlorophenols. The cresols were lethal in concentrations of 1-2 ppm. Lethal concentrations for catechols were somewhat higher. The lethal catechol dose in tissue was 6-10 mg/kg; the corresponding value for higher phenols was about 200 mg/kg. The median lethal dose for chlorinated catechols was 1-3 ppm depending on the compound; the median lethal dose for trichlorophenols was of the same order of magnitude. In order to obtain information regarding the toxic effects of pulp mill effluents, it is recommended that both acute and chronic experiments with fish and crustaceans should be carried out by testing several compounds together and as they appear in natural conditions.

81-2244. Buccafusco, R. J.; Ells, S. J.; LeBlanc, G. A. (Allied Chem. Corp., Morristown, NJ 07960) **Acute toxicity of priority pollutants to bluegill *(Lepomis macrochirus).*** *Bull. Environ. Contam. Toxicol.* 26(4): 446-452; 1981 (4 references).

Young of the year bluegill were exposed to various priority pollutants including benzenes [1,2-dichlorobenzene (*o*-dichlorobenzene), 1,4-dichlorobenzene (*p*-dichlorobenzene), trichlorobenzene], chlorinated ethanes, ethers, phenols (2,4-dinitrophenol,

2,4,6-trichlorophenol). dichloropropanes, dichloropropene, phthalate esters and ethylenes. The overall degree of toxicity for these groups increased as follows: chlorinated phenols, chlorinated benzenes, chlorinated ethylenes, and chlorinated ethanes. The acute toxicity of most of the chemicals tested was at concentrations above their water solubility; the test material of one or more of its constituents precipitated in the test jars or formed a slick on the water surface. Solubility observations are given for each of the chemicals along with the 24 and 96 hr LC50 information based on nominal concentrations for the chemicals tested. For the four chemical groups with which sufficient data were generated (benzenes, ethanes, ethylenes and phenols) it was determined that the severity of toxicity was significantly related to the degree of chlorine substitution.

81-2245. Chin, B. H.; McKelvey, J. A.; Calisti, L. J.; Kozbelt, S. J.; Sullivan, L. J. (Diamond Shamrock Corp., Dep. Saf. Assess., Painesville, OH 44077) **A comparison of *in vivo* and *in vitro* (tissue explant) techniques: metabolic profile of ethylcyclohexane in rat and dog.** *Bull. Environ. Contam. Toxicol.* 26(4): 461-465; 1981 (9 references).

Metabolic profiles of the carbaryl metabolite ethylcyclohexane (ECH) in the urine of rats and dogs exposed to the ECH vapor were generated, and these profiles were compared with *in vitro* metabolic profiles generated by liver. The latter resulted from the incubation of ECH with the livers of rats or dogs. For the *in vivo* tests the dogs and rats were exposed to an approximate concentration of 1 mg/l. A major portion of the absorbed ECH was excreted in the urine of the rats exposed to 1 mg/l concentrations. A total of 6 unknown ECH metabolites were found, one accounting for 90% of the radioactivity in the 24 hr urine. Chromatographic profiles of ECH metabolites of dogs were very similar to those of rats. Based on the chromatographic profile analysis of *in vitro* derived metabolites of ECH in rat and dog, the *in vitro* results semiquantitatively reproduced the *in vivo* urinary metabolism of ECH in the corresponding animal species. Thus the *in vitro* technique is species specific and offers promise as a method to determine human metabolism semiquantitatively without resorting to the direct dosing of a human subject. The human metabolic information obtained by the *in vitro* technique can facilitate selection of animals with a metabolic pattern similar to that of humans to be used for further in depth toxicity studies.

81-2246. Best, J. B.; Borita, M.; Abbotts, B. (Dep. Physiol. & Biophys., Colordo State Univ., Fort Collins, CO 80523) **Acute toxic responses of the freshwater planarian, *Dugesia dorotocephala*, to chlordane.** *Bull. Environ. Contam. Toxicol.* 26(4): 502-507; 1981 (11 references).

Planarians were maintained in aged tap water and exposed to chlordane. The median 5-day lethal dose was calculated to be 5-10 ppm. The 10-day LC50 was calculated to be 1-5 ppm. Head lesions or resorptions were characteristic sublethal responses of these planarians to chlordane. The incidence of fissioning within the initial 10 days is a biphasic function of aqueous chlordane concentration; low concentrations increase fissioning incidence above control values, higher concentrations suppress it. These effects of chlordane on fissioning differ from those noted with other toxicants. In acute bioassays planarians would prove to be about 2 orders of magnitude more sensitive than mammals to chlordane.

81-2247. Babu, K. A.; Nigam, S. K.; Lakkad, B. C.; Bhatt, D. K.; Karnik, A. B.; Thakore, K. N.; Kashyap, S. K.; Chatterjee, S. K. (Natl. Inst. Occup. Health, Meghani Nagar, Ahmendabad 380016, India) **Effect of hexachlorocyclohexane on somatic and meiotic divisions in male Swiss mice.** *Bull. Environ. Contam. Toxicol.* 26(4): 508-512; 1981 (9 references).

Male inbred Swiss mice were given an ip injection of 0.2 ml colchicine 4 hr prior to sacrifice. The animals had been fed a diet consisting of 70% cracked wheat, 20% cracked bengal gram, 5% fish meal, 4% yeast powder, 0.1% groundnut oil and 0.5% shark liver oil in the form of dry mash. The experimental group was fed 500 ppm HCH (BHC) in their diets. Bone marrow studies revealed no significant chromosomal aberrations. The mitotic index did not show any alteration. Cellular divisions in testes in 3 mo HCH-fed groups did not show any observable effect on either the frequency of divisions or on chromosomes structure. After continuation of HCH feeding up to 5 and 8 mo of age, the spermatogonial and all the mitotic division stages showed a significant numerical reduction asserting the inhibitory effect of HCH. A significant recovery was noted in the group where HCH feeding was discontinued for 2 mo prior to sacrifice. It was concluded that, regardless of the mechanisms involved, HCH caused stickiness which would result in lagging of chromosomes during the movement of chromosome complements towards poles leading either to unequal distribution of chromatin or loss of the same as micronuclei. A potential danger of infertility and abnormal reproduction for workers involved in manufacturing and formulating plants and pesticide spraymen who are repeatedly exposed to this pesticide is suggested.

81-2248. Grue, C. E.; Powell, G. V. N.; Gladson, N. L. (Patuxent Wildl. Res. Cent., US Fish & Wildl. Serv., Laurel, MD 20811) **Brain cholinesterase (ChE) activity in nestling starlings: implications for monitoring exposure of nestling songbirds to ChE inhibitors.** *Bull. Environ. Contam. Toxicol.* 26(4): 544-547; 1981 (9 references).

Nesting activity was monitored in 75 nest boxes of songbirds located on the Patuxent Wildlife Research

Center between March and July of 1979. Nestlings were collected at 3, 8, 11-14 and 18 days of age. Relationships between nestling age and brain ChE levels were determined using linear regression. Brain ChE activity was age dependent and increased linearly toward adult levels. ChE levels in 18-day old nestlings were 70% of those found in brains of adults, though young were within 1 to 3 days of fledging. Development of brain ChE at a constant rate would result in adult levels at 28 days of age. Differences in brain ChE activity between broods of 13-day old starlings were not significant. The pattern of development of brain ChE activity differs temporally between altricial and precocial bird species. In precocial species, brain ChE activity appears to increase to adult levels during embryonic development. It is noted that age should be considered when monitoring the degree of exposure altricial nestlings sustain from pesticides that are ChE inhibitors. Nestlings selected for comparison of treated and control areas should be the same age unless an age-related correction factor can be devised.

81-2249. Lieberman, M. T.; Alexander, M. (Lab. Soil Microbiol., Dep. Agron., Cornell Univ., Ithaca, NY 14853) **Effects of pesticides on decomposition of organic matter and nitrification in sewage.** *Bull. Environ. Contam. Toxicol.* 26(4): 554-560; 1981 (17 references).

Carbaryl, malathion, diazinon, chlorpyrifos, dichlorvos, bendiocarb, or 2,4-D in concentrations ranging from 0.1 to 100 μg/ml exhibited little or no toxicity to microorganisms degrading organic matter in sewage. Although the results varied somewhat among different experiments, 1.0 μg/ml of each of the chemicals had little or no detrimental effect. Even at 100-fold concentrations, no suppression of microbial activity was noted, with the exception of propoxur. Propoxur was toxic at 10 μg/ml; a test with this concentration revealed that 51% of the DO remained after 187 hr, as compared to 2% in a pesticide-free control. Only carbaryl was demonstrated to be detrimental to nitrification. It is noted that several of these pesticides (nonpropoxur) were metabolized during the test period; possible harm that might ensue following their entry into sewage systems would soon be dissipated.

81-2250. Aerts, C.; Voisin, C. (Lab. Pathol. Resp. Exp. & Pollut. Atmos., Inst. Pasteur, F-59651 Villeneuve-d'Ascq, France) ***In vitro* toxicity of oxygen and oxygen-paraquat association on alveolar macrophages surviving in gas phase.** *Bull. Eur. Physiopathol. Resp.* 17(Sppl): 145-151; 1981 (9 references).

An *in vitro* technique of gas phase cell culture was used to study oxygen and oxygen-paraquat toxicity to guinea pig macrophages. Alveolar macrophages were cultured, without any interposition of liquid medium between them and the surrounding atmosphere, in aerobic conditions mimicking those existing in the bronchoalveolar spaces. Atmospheres containing 95% oxygen + 5% carbon dioxide or 95% air + 5% CO_2 and paraquat at 1 and 10 μg/ml were used in the cultures for 48 or 72 hr exposures. A cytotoxicity index of -Δ% ATP content in exposed cells was prepared. Large variations were noted in susceptibility of the different batches of exposed cells. These variations were correlated with the total superoxide dismutase (SOD) activity of the cell population at the start of the gas phase culture, measured either by cytochrome *c* or by epinephrine assay. Peritoneal macrophages were more susceptible than alveolar macrophages. The effects of paraquat on alveolar macrophages were studied on the same batches of cells cultured either in liquid or in gas phase. The cytotoxicity of paraquat at 1 and 10 μg/ml was greater in all cases where the cells were in direct contact with air. Large variations were observed in the cytotoxic effect of paraquat on alveolar macrophages surviving in gas phase; these were significantly negatively correlated with the total SOD activity. Alveolar macrophages cultured in an atmosphere of 95% oxygen were more susceptible to paraquat than those cultured in 95% air.

81-2251. Gardner, W. S.; Miller, W. H. (Columbia Natl. Fish. Res. Lab., US Fish & Wildl. Serv., Columbia, MS 65201) **Intracellular composition and net release rates of free amino acids in *Daphnia magna*.** *Can J. Fish. Aquat. Sci.* 38(2): 157-162; 1981 (25 references).

Free amino acids and ammonia extraction by *Daphnia magna* was measured by examining *in vitro* changes in the concentration of the 2 forms of nitrogen over 4-6 hr. The mean weight-specific amino acid release rate for 32 healthy daphnids was 0.13 nmol/hr, compared with a mean ammonia excretion rate of 21 nmol/hr. The net removal from solution was noted when low levels of amino acids were added to the water before incubation, indicating that measured net release rates could be reduced by amino acid uptake. Toxic levels of lead, arsenic, Kepone (chlordecone), toxaphene, malathion or pentachlorophenol (PCP), when added to stress the animals, did not significantly affect release rates of amino acids or ammonia. The addition of copper increased amino acid release by daphnids and hindered microbial removal of amino acids from incubation waters. The amino acids released from copper-exposed animals were similar in composition to those in intracellular amino acid pools of *D. magna*. This suggests that diffusion across cell membranes may have been the mechanism for amino acid release.

81-2252. Meerman, J. H. N.; Beland, F. A.; Mulder, G. J. (Dep. Pharmacol., State Univ. Groningen, Groningen, The Netherlands) **Role of sulfation in the formation of DNA adducts from *N*-hydroxy-2-acetylaminofluorene in rat liver *in vivo*. Inhibition of *N*-acetylated aminofluorene adduct formation by pentachlorophenol.** *Carcinogenesis* 2(5): 413-416; 1981 (28 references).

Rats pretreated with pentachlorophenol (PCP) were given *N*-hydroxy-2-acetylaminofluorene (N-OH-AAF) 45 min later and 4 hr after this dosing the animals were sacrificed and hepatic DNA was isolated. In DNA from control livers, two acetylaminofluorene and one aminofluorene-substituted deoxyguanosine adducts were found. Of the total binding in hydrolyzed DNA 40% was the acetylaminofluorene derivatives, *N*-(deoxyguanosin-8-yl)-2-acetylaminofluorene and 3-(deoxy-guanosin-N^2-yl)-2-acetylaminofluorene. *N*-(Deoxyguanosin- 8-yl)-2-aminofluorene, the aminofluorene adduct, accounted for the remainder. In rats pretreated with PCP, total DNA binding was increased by 26%. The same three adducts were found, but the acetylaminofluorene adducts accounted only for 13% of the total and the aminofluorene adduct accounted for 87%. The absolute amount of aminofluorene adduct was not changed when compared to controls. These data demonstrate the involvement of N-O-sulfation in carcinogen-DNA binding and indicate that at least 70% of the acetylaminofluorene bound to deoxyguanosine in rat liver DNA, *in vivo*, is formed through N-O-sulfation of N-OH-AAF.

81-2253. Vadi, H. V.; Neal, R. A.* (Cent. Environ. Toxicol., Dep. Biochem., Sch. Med., Vanderbilt Univ., Nashville, TN 37232) **Microsomal activation of thioacetamide-*S*-oxide to a metabolite(s) that covalently binds to calf thymus DNA and other polynucleotides.** *Chem. Biol. Interact.* 35(1): 25-38; 1981 (53 references).

Liver microsomes from phenobarbital-pretreated rats catalyzed the conversion of the fungicide thioacetamide-*S*-oxide to a reactive intermediate in the presence of NADPH. The reactive intermediate covalently binds to calf thymus DNA, calf liver RNA, polyguanylic acid and polyadenylic acid. The highest level of binding occurred with polyguanylic acid, followed by polyadenylic acid, RNA, and then DNA. Radioactivity was incorporated into DNA linearly for 30 min. There was a requirement for NADPH for time-dependent covalent binding to occur. Performing microsomal incubations in an atmosphere of 80% carbon dioxide + 20% oxygen or adding partially purified anti-cytochrome P450 immune serum to the microsomal incubations inhibited the total metabolism of thioacetamide-*S*-oxide. When microsomes isolated from phenobarbital treated rats were incubated with thioacetamide, in the presence of NADPH, only background levels of radioactivity were incorporated into calf thymus DNA. It was concluded that thioacetamide-*S*-oxide is an obligatory intermediate in the metabolic activation of thioacetamide to a reactive metabolite which binds to calf thymus DNA.

81-2254. Gold, B.; Leuschen, T.; Brunk, G.; Gingell, R. (Med. Cent., Univ. Nebraska, Omaha, NE 68105) **Metabolism of a DDT metabolite via a chloroepoxide.** *Chem. Biol. Interact.* 35(2): 159-176; 1981 (23 references).

Studies were performed on the metabolism of DDMU, a metabolite of DDT. Female mice were administered 500 mg DDMU/kg, 500 mg DDMS/kg, 500 mg DDNU/kg, 250 mg DDMU-epoxide/kg, 25 mg DDA/kg, 25 mg αOH-DDA/kg, 500 mg αC1-DDCHO/kg, or 25 mg αC1-DDA/kg. Urine was collected daily for 3 days and analyzed for metabolites. DDMU was partially metabolized to αOH-DDA and other metabolites, which were excreted. DDMS and DDNU, however, were metabolized to αOH-DDA to a much lesser extent than was DDMU. The results indicate that DDMU may be metabolized via a chloroepoxide. Evidence is presented which elucidates the possible mechanism of DDT tumorigenicity in mice. The DDMU-epoxide intermediate is excreted as αOH-DDA, which has been shown to be mutagenic in the Ames assay. The DDMU-epoxide administered to mice in this study was excreted as αOH-DDA. This intermediate is possibly responsible for DDT mutagenicity.

81-2255. Maliwal, B. P.; Guthrie, F. E. (Toxicol. Progr., Dep. Entomol., North Carolina State Univ., Raleigh, NC 27650) **Interaction of insecticides with human plasma lipoproteins.** *Chem. Biol. Interact.* 35(2): 177-188; 1981 (22 references).

Studies were conducted to examine some of the effects of three classes of pesticides (chlorinated hydrocarbons, carbamates, and organophosphates) on human plasma lipoproteins. Dialysis procedures were used to determine binding between the insecticides and plasma proteins in both high and low densities. The results of these studies showed that binding is a result of partitioning, and not a stoichiometric process. Kinetic parameters were calculated. The highest *K*-value was for DDT ($3 \times 10^5 M^{-1}$) and the lowest was for aldicarb ($< 10 M^{-1}$).

81-2256. Sugimura, T.; Nagao, M. (Natl. Cancer Res. Inst., Tokyo, Japan) **Modification of mutagenic activity.** In: *Chemical Mutagens. Principles and Methods for Their Detection.* de Serres, F. J. and Hollaender, A., eds. (Plenum Press: NY): 6(CH02): 41-60; 1980 (75 references).

This review covers available information on factors which modify results from the *Salmonella*/microsome mutagenic system. The advantages and disadvantages of different strains of bacteria, and the comutagenic action of norharman, a naturally occurring β-carboline derivative in tobacco tar and charred parts of fish and meat, are described. The following factors that influence metabolic activation are considered: species and sex of the animals used as the sources of metabolic activating enzymes, specific organs used, inducers of drug-metabolizing enzymes, cofactors and other components, riboflavin, NADH and ATP, enzymes, glucose, and dimethylsulfoxide. DDT and DDE were not mutagenic in *Salmonella* assays but were mutagenic in *Drosophila* assays. Discussion is also given to the amount of S-9 used in the tests, preincubation time and

bacterial strains. γ-BHC (lindane) was mutagenic in tests with monkey liver S-9 mix. Comutagenic actions of norharman and related compounds considered include demonstration of the mutagenic activities of aniline, o-toluidine, yellow OB and DAB in the presence of norharman in the incubation medium. The antimutagenic action of protease inhibitor is also considered.

81-2257. Williams, G. M. (Naylor Dana Inst. Dis. Prev., Am. Health Fnd., Valhalla, NY 10595) **The detection of chemical mutagens/carcinogens by DNA repair and mutagenesis in liver cultures.** In: *Chemical Mutagens. Principles and Methods for Their Detection.* de Serres, F. J. and Hollaender, A., eds. (Plenum Press: NY): 6(CH03): 61-79; 1980 (53 references).

The work described in this review was aimed at developing sensitive and reliable mammalian cell systems that could be useful as part of a test battery for the screening of chemicals. The cell systems developed used liver derived cells since this organ possesses the broadest capabilities for metabolizing chemical carcinogens. Only studies involving DNA repair and mutagenesis are presented. Various types of chemical carcinogens (including aminoazo dyes, PAHs, nitrosamines, and aromatic amines) are considered along with metabolic activation capabilities of the liver, and the techniques for establishing liver cultures. Hepatocyte primary cultures and long-term epithelial cultures are discussed. The metabolism of carcinogens in liver cultures is considered. An hepatocyte primary culture/DNA repair assay is presented, including information on both the autoradiographic assay and the liquid scintillation counting assay. Also considered are the mutagenesis of rat liver epithelial lines, and hepatocyte-mediated mutagenesis of rat liver epithelial lines.

81-2258. Rosenkranz, H. S.; Leifer, Z. (Dep. Microbiol., New York Med. Coll., Valhalla, NY 10595) **Determining the DNA-modifying activity of chemicals using DNA-polymerase-deficient *Escherichia coli*.** In: *Chemical Mutagens. Principles and Methods for Their Detection.* de Serres, F. J. and Hollaender, A., eds. (Plenum Press: NY): 6(CH05): 109-147; 1980 (67 references).

An alternative approach to rapid detection of environmental mutagens and carcinogens, other than the *Salmonella* mutagenicity assay, takes advantage of the DNA-modifying ability of various biologically active agents. It was demonstrated that cells deficient in their ability to repair DNA damage, especially DNA-polymerase-deficient bacteria, are more sensitive than their normal counterparts to the growth-inhibiting properties of DNA-modifying agents. On the basis of these findings and the fact that DNA polymerase I plays a pivotal role in several DNA repair pathways, a simple and rapid disk-diffusion procedure using a pair of normal (pol A+) and DNA-polymerase-I-deficient (pol A_1-) *Escherichia coli* indicator strains was devised. This procedure is demonstrated to be a reliable assay for detecting carcinogens. Since the chemicals detected by *Salmonella* and pol A do not overlap completely, it is suggested that both assays are performed in tandem to maximize the probability of detecting potential carcinogens. Results obtained with the standard *E. coli* DNA-polymerase-deficient assay system, in the absence of microsomal activation, are tabulated for over 600 compounds, including 46 pesticides.

81-2259. Kada, T.; Hirano, K.; Shirasu, Y. (Dep. Induced Mutat., Natl. Inst. Genet., Misima, Sizuoka-ken 411, Japan) **Screening of environmental chemical mutagens by the rec-assay system with *Bacillus subtilis*.** In: *Chemical Mutagens. Principles and Methods for Their Detection.* de Serres, F. J. and Hollaender, A., eds. (Plenum Press: NY): 6(CH06): 149-173; 1980 (31 references).

Recent developments in techniques and mutagen screening by the rec-assay system using recombination-proficient and -deficient strains of *Bacillus subtilis* are reviewed. Topics discussed include the principles and related background of the rec-assay; experimental procedures including the rapid streak method without metabolic activation, cold incubation, quantitative analysis by the spore rec-assay with and without metabolic activation, preparation of spores, spore agar plates, rat liver microsomal fraction, cofactor solutions, spore rec-assay procedure without metabolic activation, spore rec-assay procedure with metabolic activation, and the quantitative aspects. The quantitative liquid method is discussed with and without metabolic activation. Examples are given of the detection of chemical mutagens by the rec-assay procedures including results obtained for the pesticides captafol, captan, Dexon (fenaminosulf) dichlorvos, dichlofluanid, ETU (ethylene thiourea), folpet, HEH, NBT, NNN, vamidothion, bisdithane, DDC, ferbam, TMTD (thiram), TTCA and ziram.

81-2260. Pienta, R. J. (Chem. Carcinog. Program, NCI, Frederick Cancer Res. Cent., Frederick, MD 21701) **Transformation of syrian hamster embryo cells by diverse chemicals and correlation with their reported carcinogenic and mutagenic activities.** In: *Chemical Mutagens. Principles and Methods for Their Detection.* de Serres, F. J. and Hollaender, A., eds. (Plenum Press: NY): 6(CH07): 175-202; 1980 (77 references).

The use of early passage Syrian hamster cells for identifying carcinogens is discussed. Results from this cell transformation system are correlated with reported results from the bacterial mutagenesis system and chronic carcinogenicity tests in animals. Specific topics discussed include the use of mammalian cell transformation systems as prescreens for identifying carcinogens in the environment;

hamster embryo cell *in vitro* carcinogenesis bioassay with specifics on standardization of the bioassay procedure by the use of cryopreserved cells and the criteria for a positive response; the correlation of transformation response with reported carcinogenicity and mutagenicity with specifics on direct-acting alkylating agents, polycyclic aromatic hydrocarbons, nitrosamines and nitrosamides, aromatic amines, aminoazo dyes and nitro compounds, carcinogenic metallic salts, and miscellaneous compounds (including methoxychlor, methyl carbamate and thiourea); metabolic activation; and the use of a battery *vs.* a tier of short-term tests for identifying potentially carcinogenic chemicals.

81-2261. Tazima, Y. (Natl. Inst. Genet., Misima, Japan) **Chemical mutagenesis in the silkworm.** In: *Chemical Mutagens. Principles and Methods for Their Detection.* de Serres, F. J. and Hollaender, A., eds. (Plenum Press: NY): 6(CH08): 203-238; 1980 (74 references).

Various methods have been developed to detect mutagenic compounds. The most convenient are bacterial systems and *in vitro* mammalian cytogenetic systems, all of which detect somatic mutations. The detection of the potential to produce mutations in germ cells that will be transmitted to the descendant generations can be made using *Drosophila.* The method can also be used conveniently with the silkworm, *Bombyx mori* L. The system involves treatment of developing oocytes in a wild-type strain by injecting a test chemical and assay of the mutations produced at marked loci. The system as described is useful for detecting mutagenicity of direct mutagens and/or carcinogens. Chemicals tested include aziridines, mustards, nitrosamines, expoxides, alkylsulfonic acid, PCBs, β-BHC and α-BHC (lindane). The system is generally not suitable for indirect-acting compounds. Additional findings have suggested that a more sensitive test method can be devised if more effective means are developed for treatment of male germ cells at the spermatid stage.

81-2262. Rinkus, S. J.; Legator, M. S. (Dep. Prev. Med. & Commun. Health, Div. Environ. Toxicol., Univ. Texas Med. Branch, Galveston, TX 77550) **The need for both *in vitro* and *in vivo* systems in mutagenicity screening** In: *Chemical Mutagens. Principles and Methods for Their Detection.* de Serres, F. J. and Hollaender, A., eds. (Plenum Press: NY): 6(CH13): 365-473; 1980 (356 references).

A perspective on the use of *in vitro* systems in mutagenicity screening is presented. The inadequacies of *in vitro* systems when used alone for the qualitative identification of mutagens are reviewed. A reanalysis of the alleged high correlation between carcinogenicity in animal testing and mutagenicity in the premier *in vitro* system, the *Salmonella*/S-9 system, is made. The mutagenicity findings in the *Salmonella*/S-9 system for the carcinogenic pesticides *bis*(2-chloroethyl) ether, aldrin, *p,p'*-DDT, dieldrin, heptachlor, amitrole, chlorobenzilate, mirex, Strobane, di-allate, *N*-(2-hydroxyethyl) hydrazine and PCNB (quintozene) are presented in tabular form. The false negatives observed in the correlation studies are discussed in terms of their biological and chemical activities. Chemical trends and *Salmonella* testing results of 465 compounds (including several pesticides) with known or suspected carcinogenic activity are also included in tabular form. It is concluded that mutagenicity testing of the sophistication needed under the Toxic Substances Control Act is best accomplished by a battery of *in vitro* and *in vivo* systems in the initial, screening phase.

81-2263. Denison, M. S.; Chambers, J. E.; Yarbrough, J. D. (Dep. Biol. Sci., Mississippi State Univ., Mississippi State, MS 39762) **Persistent vitellogenin-like protein and binding of DDT in the serum of insecticide-resistant mosquitofish *(Gambusia affinis).*** *Comp. Biochem. Physiol. C* 69(1): 109-112; 1981 (16 references).

During the reproductive season the serum of most oviparous teleosts contains an electrophoretically- identifiable protein, vitellogenin. However, serum from insecticide-resistant mosquitofish contain a vitellogenin-like protein (VLP) year round. It is suggested that estrogenic and/or pro-estrogenic xenobiotics from the environment of the fish induces the formation of this protein during the non-reproductive season. *In vitro* incubation of *p,p'*-[^{3}H]DDT with reproductive or non-reproductive resistant and susceptible fish serum, led to its association with three separate proteins (VLP, a low molecular wt lipoprotein and albumin). Xenobiotics thus may induce the formation of protein (VLP), in non-reproductive resistant fish, which can bind and transport insecticides. (Author abstract by permission)

81-2264. Amir, D.; Tadmor, A. (Agric. Res. Inst., Volcani Cent., Bet Dagen, Israel) **The different labelling pattern of the genital tract of bulls and rams after a peritesticular injection of (^{3}H)ethylene dibromide.** *Comp. Biochem. Physiol. C* 69(1): 121-131; 1981 (14 references).

The labeling pattern of the genital tract of bulls and rams injected peritesticularly with a single dose of [^{3}H]ethylene dibromide was followed by autoradiography of histological sections of the testes and epididymides of treated animals castrated 6, 12, 24, and 72 hr after injection. The radioactivity in the genital tract of the bulls rose at 12 hr and again at 72 hr after injection, whereas in the rams the peak of radioactivity was found 6 hr and 12 hr after injection in the testes and epididymides, respectively. In the bull testes the precursor was localized mainly in the cytoplasm of spermatids, whereas in the rams it was scattered in the seminiferous epithelium. These results are discussed in connection with the susceptibility of bull and the immunity of ram spermatozoa to the spermicidal action

of the above treatment found in previous studies. (Author abstract by permission)

81-2265. Down, W. H.; Chasseaud, L. F. (Dep. Metab. & Pharmacokinet., Huntingdon Res. Cent., Huntingdon, England) **Hepatic microsomal drug-metabolizing enzyme activity in non-human primates; the effect of repeated oral administration of DDT to baboons and rhesus monkeys.** *Comp. Biochem. Physiol. C* 69(1): 165-168; 1981 (34 references).

Hepatic microsomal *N*-demethylase activity was present in the order, rat > baboon > rhesus monkey. By contrast, *O*-demethylase activity was in the order, rhesus monkey > baboon > rat. Reductase and hydroxylase activities respectively were similar in each species. Chronic administration of DDT to each species caused increases (up to 2-fold) in these enzyme activities in liver wt and in cytochrome P450 and protein concentrations. Glucuronyltransferase activity was present in the order, rhesus monkey > baboon > rat, and was lowered by DDT treatment. Cytochrome P450 concentrations and *O*-demethylase activity in baboons were similar to that found in human, and similar to those found previously in baboons. In the rat, increases in Phase I enzyme activities due to DDT treatment appear to be compensated by increases in a detoxifying Phase II pathway, but this does not appear to be the case in non-human primates; thus the latter species could be more sensitive to toxic agents. (Author abstract by permission)

81-2266. Lievremont, M.; Le Flohic, J. F.; Pascaud, M. (Lab. Physiol. Biochim., Ecole Normale Super. Cachan, F-94230 Cachan, France) **Distribution du ^{14}C-lindane chez le rat apres administration d'une dose unique par voies intraperitoneale et intraveineuse. [Distribution of ^{14}C-lindane in the rat after intraperitoneal and intravenous administration of single doses.]** *C. R. Acad. Sci. Ser. D* 292(1): 45-48; 1981 (6 references) (French).

The distribution of ^{14}C-labeled lindane (1 mg/100 g body wt) was studied in Wistar rats within 24 hr after ip or iv administration of a single dose. Very rapid distribution of lindane was observed. Lindane was present in the urine within 30 min after either administration method. The elimination of the intact substance or its metabolites was not completed in 24 hr. The lindane level in the adipose tissue was highest between 6 and 18 hr after administration. The highest levels were found in the adipose tissue, and, after iv administration, high levels were found temporarily in the lungs as well. The lindane levels were low and decreased rapidly in the brain.

81-2267. Borie, F.; Chantrier, N.; Huve, J. L.; Thomson, M. A. (Groupe Etudes Pluridisciplinaire Pollut. Eaux, Univ. Pierre & Marie Curie, F-75005 Paris, France) **Utilisation de l'activite bioelectrique du bulbe olfactif de la truite *Salmo gairdneri* dans la detection de pesticides. [Utilization of the bioelectric activity of the olfactory bulb of trout, *Salmo gairdneri* in the detection of pesticides.]** *C. R. Acad. Sci. Ser. D* 292(2): 235-238; 1981 (6 references) (French).

The effect of nasal infusions of 3 pesticides (atrazine, lindane, and parathion) on the bioelectric activity of the olfactory bulb was studied in 30 rainbow trout. The pesticides were used in the concentration range of 1 ng/l to 1 mg/l. All 3 substances caused increases in the amplitude of the response signal. The effect was most pronounced in the case of atrazine, which caused an ~ 100% increase in the amplitude compared to the spontaneous amplitude. The response was most pronounced at higher concentrations, but no clear dose-response relationship was observed at lower concentrations of the pesticides.

81-2268. Amer, S. M.; Ali, E. M. (Lab. Genet. & Cytol., Natl. Res. Cent., Cairo, Egypt) **Cytological effects of pesticides. XI. Meiotic effects of the herbicides monochloroacetic and trichloroacetic acids.** *Cytologia* 45(4): 715-719; 1981 (15 references).

Vicia faba plants, 15 and 35 days old, were sprayed with aqueous solutions of MCA and TCA at 0.05 mg/ml. Both herbicides caused a significant percentage of abnormal PMC's/plant. No correlation could be made between the percentage of abnormal PMC's in the different meiotic stages and the age of the plants. The most prevalent type of anomaly was lagging chromosomes. Chromosome stickiness and fragmentation were also noted. Anaphase bridges and disturbed MII and AII, where the chromosomes spread irregularly in the cell, were also noted but to a lesser extent. Both agents exhibited slight effects on pollen viability.

81-2269. Chang, M. H. (Univ. Georgia, Atlanta, GA) **Acetylcholine levels in insecticide treated insects and mammals.** *Diss. Abstr. Int. B* 41(10): 3757; 1981.

The effect of the chlorinated hydrocarbon insecticide DDT, and two organophosphate (O-P) insecticides (TEPP and dicrotophos) on the free and bound levels of acetylcholine (ACh) in house flies and mice were studied in this research. ACh was measured in fly heads by gas chromatography (GC) and was confirmed by GC-mass spectrometry. Of the three methods of homogenization tested, the chop method produced the smallest free to total ACh ratio (0.16) in mouse brain. Both O-P compounds produced a slight increase in free ACh and decrease in the bound form, but not total ACh in the brains of mice at KD (knockdown). Results indicate that different O-P compounds have different effects on the ratio of free to total ACh in the brains of mice at KD. *In vivo* synthesis of ACh from intrathoracically injected ^{3}H-sodium acetate in-

dicated maximum conversion to ACh occurred within 0.5 hr after injection. Maximum conversion to ACh from ^{3}H-acetate was only 0.11% of the total radioactivity in heads and ^{3}H-ACh decreased steadily from 0.5 hr onwards. (Author abstract by permission, abridged. Copies of the thesis are available from University Microfilms, order No. 8107898.)

81-2270. Karmos, M. V.; Desi, L.; Bonnyai, E. (Cent. Occupat. Health Inst., Budapest, Hungary) **Uj szerves foszforsaveszter, a pyridathion hatasa az agy gorcskeszegere egerken. [Effect of pyridathion, a new organic phosphoric acid ester, on the brain convulsion disposition of mice.]** *Egeszsegtudomany* 24(4): 376-384; 1980 (23 references) (Hungarian).

Pyridathion, a new organic phosphoric acid ester pesticide, was tested for its effect on the convulsion disposition of mice. Chemoshock and electroshock were used to induce epileptiform convulsion. Pyridathion increased both the number of animals displaying tonic epileptic fits and the occurrence of death. A 10 day examination period did not show cumulation of the central toxic effect. It is suggested that the combined application of Seduxen and Atropin may be useful in preventing the effects of acute pyridathion poisoning.

81-2271. Kunec-Vajic, E. (Dep. Pharmacol., Med. Fac., Univ. Zagreb, YU-41001 Zagreb, Yugoslavia) **Effect of cholinesterase on the chemiluminescence of luminol.** *Experientia* 37(5): 462-463; 1981 (9 references).

To determine whether cholinesterase (ChE) exerts any action on the luminescence of luminol, and to examine the interaction between the enzyme and its inhibitors, reaction mixtures of 0.4 m*M* luminol, 45 m*M* NaOH and various concentrations of H_2O_2 were incubated with pseudocholinesterase and dimethoate, physostigmine, or TEA. The chemiluminescent oxidation of luminol was activated by ChE. Physostigmine and dimethoate inhibited the luminescence. TEA had no effect. These results indicate that the esteratic site is responsible for the activating action of the enzyme. (Author abstract by permission, supplemented.)

81-2272. Hertel, C.; Quader, H.; Robinson, D. G.; Roos, I.; Carafoli, E.; Marme, D. (Inst. Biol. III, Univ. Freiburg, D-7800 Freiburg, BRD) **Herbicides and fungicides stimulate Ca^{2+} efflux from rat liver mitochondria.** *FEBS Lett.* 127(1): 37-39; 1981 (13 references).

The effects of amiprophosmethyl, amiprophos, dichlofluanid, and captan on the accumulation of plant mitochondrial calcium were determined. Determinations were also made of the effects of these chemicals on calcium uptake by rat liver mitochondria. The fungicide captan was the least effective compound in plant mitochondria. The two fungicides, dichlofluanid and captan, exert the greatest effect on calcium release from rat liver mitochondria, whereas, most obviously for captan, they are much less effective in plant mitochondria. The herbicides tested seem to be almost equally effective in plant and rat liver mitochondria. If the herbicides and fungicides are resorbed and are not immediately metabolized in animal cells, they are able to provoke changes of the free cytoplasmic calcium level by releasing calcium from the mitochondrial stores and thus to interfere with calcium dependent biochemical and physiological processes in animals as they do in plants.

81-2273. Holmes, S. (For. Pest Manage. Inst., Sault Ste. Marie, Ontario, Canada) **Aquatic impact studies of a spruce budworm (*Choristoneura fumiferana* Clemens) control program in the lower St. Lawrence region of Quebec in 1978.** *For. Pest Manage. Inst. Rep. FPM-X* 26: 34 pp.; 1980 (5 references).

Studies were conducted to investigate the impact of spruce budworm control on the aquatic ecosystem. Two pesticides were applied, fenitrothion at 0.210 kg AI/ha and aminocarb at 0.053 kg AI/ha. Bottom fauna, invertebrate drift, fish diets and insecticide residues in fish and water were measured in several streams in the spray area. Fenitrothion concentrations in water peaked 4-5 hr after spraying, while aminocarb levels were greatest 10-13 hr after spraying. Fenitrothion reached 0.878 μg/l and aminocarb reached 0.570 μg/l. Fenitrothion appeared to increase the drift rate of mayfly nymphs. Aminocarb appeared to increase the drift rate of blackfly larvae and slightly reduced the densities of heptagenic and baetid mayfly nymphs. Fish tissues analyzed for aminocarb indicated that levels were below detection limits (< 0.003 μg/g).

81-2274. Kingsbury, P.; Kreutzweiser, D. P. (For. Pest Manage. Inst., Canadian For. Serv., Sault Ste. Marie, Ontario, Canada) **Permethrin in streams.** *For. Pest. Manage. Inst. Rep. FPM-X* 27: 42 pp.; 1980 (7 references).

Studies were conducted to determine the effects of permethrin on the biota of streams in the region of application. Specifically, the effects of double applications which have been shown to be effective against spruce budworms were determined. The pesticide was applied twice at a rate of 17.5 g AI/ha in an interval of 5 days at one site and 6 days at another. Streams and ponds in an unsprayed area of each test site were used as controls. Samples of fish, stream bank foliage, surface waters, and bottom sediment were taken periodically before and after applications and analyzed for pesticide residues by gas chromatography. The most evident result of the pesticide applications was a decrease in the level of aquatic insects. The second application had a significant effect on the further reduction of the

population. The fish food habits were altered greatly when the insect populations were reduced, but there were no indications of pesticide-related fish mortality. The insect levels returned to normal within 1.5 mo and fish food habits returned to normal after 4 mo of spraying. The levels of pesticide in the water were below detection limits (0.25 μg/l) after 12 hr in the streams and 48 hr in ponds. The highest level detected was 2.6 μg/l.

81-2275. Kingsbury, P.; McLead, B. B. (For. Pest Manage. Inst., Canadian For. Serv., Sault Ste. Marie, Ontario, Canada) **Terrestrial impact of permethrin.** *For. Pest. Manage. Inst. Rep. FPM-X* 28: 55 pp.; 1980 (5 references).

Studies were conducted to determine the effects of permethrin treatment on forest ecosystems. The pesticide was applied twice to test plots at a rate of 17.5 g/ha. Within 2 hr of the first application, 0.75 ppm was detected in foliage samples. Within 24 hr of the second application, the concentration was 1.55 ppm. Concentrations in soils ranged from not detectable to 0.12 ppm within 2 hr after spraying. The most apparent result of spraying was a heavy knockdown of insects from the forest canopy following the first application. Songbirds and small mammals did not appear to be affected by the insecticide. There appeared to be a slight effect on honeybees, which may have been due to lack of foraging activity related to weather conditions.

81-2276. Kingsbury, P.; Kreutzweiser, D. P. (For. Pest Manage. Inst., Canadian For. Serv., Sault Ste. Marie, Ontario, Canada) **Dose-effect studies on the impact of permethrin on trout streams.** *For. Pest. Manage. Inst. Rep. FPM-X* 31: 50 pp.; 1980 (5 references).

Studies were conducted to determine the effects of various concentrations of permethrin on some Canadian trout streams. Six coldwater streams were used, two as control and four as experimental. The experimental streams received either 8.8, 17.5, 35.0 or 70.0 g AI/ha. All concentrations of pesticide increased drift of aquatic insects, primarily mayflies, caddisflies, stoneflies, and chironomids. Benthic samples demonstrated decreased numbers following treatment. The drift of terrestrial invertebrates following spraying increased by as much as 23.5 times the pre-spray average. Brook trout food habits shifted substantially after spraying at the two highest rates, reflecting the changes in drifting insects, but the overall quantity of food was unchanged. It appears that the impact of the pesticide generally correlated to the applied dose.

81-2277. Holmes, S.; Kingsbury, P. D. (For. Pest Manage. Inst., Canadian For. Serv., Sault Ste. Marie, Ontario, Canada) **The environmental impact of nonyl phenol and Matacil formulation. Part 1: aquatic ecosystems.** *For. Pest. Manage. Inst. Rep. FPM-X* 35: 52 pp.; 1980 (20 references).

Studies were conducted to determine the effect of Matacil (aminocarb) and nonyl phenol (its solvent) on aquatic ecosystems. Separate treatment areas were used for testing the two compounds at various application rates. Nonyl phenol spraying resulted in stream water residues of 9.1 ppb within 1 hr of spraying, decreasing to < 2.0 ppb after 6 hr in areas of rapidly flowing water. In an area where water was stagnant, the compound reached a level of 1100 ppb 4 hr after spraying. Drifting or bottom fauna invertebrates did not appear to be affected by spraying. Caged fish mortality in treatment areas paralleled that of controls for 5 days. After 7 days, however, mortality in the treatment area was significantly higher than in the control area. Bioassays resulted in 96-hr LC50 values of 230 μg/l for fingerling rainbow trout and 145 μg/l for brook trout. Matacil studies indicated that residues in water peaked 0.5 hr after spraying, reaching levels as high as 24.2 μg/l. Insect drift was increased for 1 day after spraying. Terrestrial invertebrates were significantly reduced for 3 days after spraying.

81-2278. Kingsbury, P. D.; McLeod, B. B.; Millikin, R. L. (For. Pest Manage. Inst., Canadian For. Serv., Sault Ste. Marie, Ontario, Canada) **The environmental impact of nonyl phenol and the Matacil formulation. Part 2: terrestrial ecosystems.** *For. Pest Manage. Inst. Rep. FPM-X* 36: 68 pp.; 1980 (50 references).

Studies were conducted to determine the effects of nonyl phenol and Matacil (aminocarb) on terrestrial ecosystems. In the spring of 1979 40 ha plots were sprayed twice at rates of either 0.070 or 0.105 kg AI/ha. A 40 ha plot was sprayed with 0.175 kg nonyl phenol. The most significant effect noted during this study was the large knockdown of terrestrial canopy induced by 0.105 kg Matacil/ha. The lower dose rate of Matacil caused a moderate knockdown of terrestrial invertebrates. Forest songbirds were not affected by the pesticide or its solvent. The nonyl phenol did not affect honeybee populations.

81-2279. Abel, P. D. (Dep. Biol., Sunderland Polytechn., Sunderland SR1 3SD, England) **Toxicity of γ-hexachlorocyclohexane (lindane) to *Gammarus pulex*: mortality in relation to concentration and duration of exposure.** *Freshwater Biol.* 10(3): 251-259; 1980 (12 references).

Studies were conducted on the toxicity of lindane to *Gammarus pulex*. Wild-caught amphipods were exposed to concentrations of 4 to 0.01 mg/l in 500 ml test solutions of aerated tap water. Tests were observed continuously for 12 hr, then at frequent intervals thereafter. Median survival times and 95% confidence intervals were estimated for each concentration. Median survival times ranged from 0.57 hr for 2 mg/l to 116 hr for 0.01 mg/l. Toxicity curves

for concentrations and LT50s and LD50s were obtained. The duration of exposure that caused 50% mortality was significantly less than that expected for continuously exposed organisms.

81-2280. Akhundov, V. Yu.; Lur'e, L. M.; Ismailova, I. M. (Acad. Sci. Azerbaidzhan SSR, USSR) **Vliyanie Sevina na immunologicheskuyu reaktivnost' organizma. [Effect of Sevin on immunologic reactivity.]** *Gig. Sanit.* 46(2): 25-28; 1981 (6 references) (Russian).

Rabbits and guinea pigs were given oral doses of 15 mg/kg Sevin (carbaryl) for 42 days. The autosensitizing effect of heated vaccine from *Salmonella typhimurium* was then tested. The vaccine at doses of 250 or 500 million microbial cells was administered 3 times at 5 day intervals, beginning on day 21 of the experiment. When autoantibodies were determined by Hoigne's method in Klemparskaya's modification, it was seen that treatment with Sevin enhanced the autosensitizing effect of the vaccine. Additional experiments in which guinea pigs were treated with 15 mg Sevin/kg for 3 mo indicated that a delayed hypersensitivity developed (as assessment by the inhibition of macrophage migration).

81-2281. Goldfrank, L.; Flomenbaum, N.; Weisman, R. S. (Sch. Med., New York Univ., New York, NY) **Rodenticides.** *Hosp. Physician* 17(4): 81-83, 87-89, 93-95, 99; 1981 (9 references).

A discussion is presented of the various types of commercially available rodenticides, and of methods of treatment of poisoning cases. It is pointed out that there is a wide variety of rodenticides on the market, and that the most important information in dealing with poisoning is knowledge of the name or at least of the type of poison ingested. A table is presented in which the name of each rodenticide is listed, along with its physical characteristics, toxic mechanism, estimated fatal dose, symptoms, time to onset, and antidote. Some of the most highly toxic rodenticides (thallium, sodium monofluoroacetate, strychnine, zinc phosphide, and arsenic) are discussed in more detail. ANTU and DDT are classified as moderately toxic rodenticides. The remaining rodenticides are of low toxicity (LD50 between 500 and 5000 mg/kg). The rodenticides which contain anticoagulants are listed. The mechanisms for rodenticide poisoning are discussed, as are methods for treatment of patients.

81-2282. Andryushchenko, V. V.; Khokhryakova, O. N. (Murmansk Mar. Biol. Inst., Kola Branch, USSR Acad. Sci., Dal'niye Zelentsy, USSR) **Accumulation and elimination of DDT in the Barents Sea pollock (*Pollachius virens*).** *Hydrobiol. J. (USSR)* 16(1): 47-50; 1980 (13 references).

The tissue distribution, bioaccumulation and extraction of DDT were studied in the Barents Sea pollock. Fish were acclimated to aquaria conditions for 2 wk before the start of the experiment. They were then exposed to 1.5 μg/l DDT for 2 wk. After treatment the fish were kept in pure running water for 1 mo. Tissue samples were taken after 12 hr, on days 1, 3, 7 and 14 of exposure, and on days 1, 3, 7, 14 and 30 after exposure ended. Actual DDT exposure varied; average levels were 0.0015 mg/l. The maximum accumulation of DDT was found in the liver at 2.9 mg/kg. Concentrations in the gills and muscles was appreciably lower, 0.0216 and 0.030 mg/kg, respectively. Maximum muscle and liver concentrations were recorded on day 3 of exposure. Maximum gill content occurred 12 hr after exposure began. No DDT metabolites were found in any of the analyzed biosubstrates. It is suggested that the metabolism of organochlorine pesticides was slowed under low temperature conditions.

81-2283. Crawford, S. A. (Dep. Biol., State Univ. New York, Morrisville, NY 13408) **Successional events following simazine application.** *Hydrobiologia* 77(3): 217-223; 1981 (15 references).

A 3-yr study was designed to determine the successional events of aquatic vegetation in a farm pond following application of simazine. The normal successional events in the pond were followed for 2 non-consecutive yr and the effects of the herbicide were observed in a 3rd yr. The 7-yr-old pond was dominated by the beneficial macrophytic alga *Chara vulgaris* for up to 5 yr. Massive growth of the macrophytes *Najas flexilis* and *Potagometon foliosus* occurred in the 2nd observation yr which necessitated treatment of the pond with 50 lb (18.65 kg) of simazine to eliminate all vegetation. The chemical and physical parameters of the water were measured weekly in observation years and vegetational changes were traced. Following the decay of the higher plants due to the simazine treatment, phytoplankton did not dominate as may have been expected. Rather, herbicide-resistant seeds and subsurface structures of *P. foliosus* developed. The bottom was covered and stabilized by benthic algae which allowed the growth of *C. vulgaris* in these areas.

81-2284. Rao, M. B. (Dep. Zool., Nagarjuna Univ., Nagarjunagar 522510, India) **Effect of γ-hexachloran and Sevin on the survival of the Black Sea mussel, *Mytilus galloprovincialis* Lam.** *Hydrobiologia* 78(1): 33-37; 1981 (11 references).

Laboratory investigations were conducted to determine the effects of γ-hexachloran (lindane) and Sevin (carbaryl) on the survival of the Black Sea mussel, *Mytilus galloprovincialis* Lam. In short term (7-day) tests of acute toxicity, mussels of two size groups were exposed to six different concentrations (1, 2, 4, 6, 8, and 10 mg/l) of the two insecticides. Probit analysis of log dose against response (mortality) was performed. Results indicated that younger

mussels were more susceptible than the adults to both toxicants. At concentrations of 8 and 10 mg/l of γ-hexachloran, total mortality occurred on day 6 with the small size group and on day 7 with the large size group. LC50 values for γ-hexachloran for the 7 day period were calculated to be 1.445 mg for the small size group and 1.698 mg for the larger size group. Sevin was apparently less toxic, since at a concentration of 10 mg/l the mortalities at 4 and 7 days were found to be ~ 28% and 30% in the small size group, and ~ 10% and 15% in the large size group, respectively.

81-2285. Spindle, A.; Matsumoto, N.; Iijima, S.; Pedersen, R. A. (Lab. Radiobiol., Univ. California, San Francisco, CA 94143) **Sensitivity of early mouse embryos to mercury toxicity.** *In Vitro* 17(3): 202; 1981.

Early mouse embryos were treated for 24 hr with methylmercury at various pre-implantation stages *in vitro*. Methylmercury exerted immediate effects at high concentrations by arresting pre-implantation development or collapsing the blastocoel. At lower concentrations pre-implantation development was not affected, but the methylmercury did interfere with development and differentiation of the inner cell mass. Immediate effects were most severe on blastocytes. Effects were least severe on morulae. Delayed effects on postimplantation development were similar after treatments at all stages. The lowest concentration that interfered with inner cell mass development and differentiation was 5×10^{-7} *M*. Thus the sensitivity of early mouse embryos to mercury toxicity changed as development progressed. It was also concluded that inner cell mass development is affected more severely than pre-implantation development. Pre-implantation stage embryos are highly sensitive to mercury toxicity as compared to cultured somatic cells.

81-2286. Li, M. F.; Zwicker, R.; Marryatt, V. (Halifax Lab., Dep. Fish. & Oceans, Fish. & Environ. Sci., Halifax, Nova Scotia, Canada) **Toxicity of Matacil, an insecticide, assessed on cultivated cells.** *In Vitro* 17(3): 202; 1981.

This report describes the acute toxicity of Matacil (aminocarb) that could involve cellular destruction. At 5 ppm Matacil, the cell population of cultured cells was reduced dramatically within the first 24 hr of exposure. At sub-lethal concentrations, treated cells appeared to increase in size as monitored with a channelyzer. Cytological effects were studied. Matacil consists of about 20% aminocarb, 50% nonyl phenol and 30% diluent oil and the toxicity of each of these components was evaluated in the spinner culture system. The major toxicity of Matacil was due to the presence of nonyl phenol. The effect of Matacil on viral susceptibility of cultivated cells was studied by employing a fish cell-amphibian virus system. The primary results indicate that the insecticide may enhance cellular susceptibility to the virus.

81-2287. Dudeja, P. K.; Agarwal, N.; Sanyal, S.; Mahmood, A.; Subrahmanyam, D. (Dep. Biochem. & Gastroenterol., Postgrad. Inst. Med. Educ. & Res., Chandigarh 160012, India) **Effects of chronic DDT administration on the intestinal brush border membrane structure & function in rhesus monkeys.** *Indian J. Biochem. Biophys.* 17(4): 12; 1980.

DDT fed to rhesus monkeys at 10 mg/kg body wt/-day for 100 days caused increased intestinal uptake of D-glucose and L-alanine and glycine. Similar increases were observed in sucrase and lactase activities but no change was found in LDH, alkaline phosphatase, or Mg-ATPase. Kinetic studies showed that disaccharide enhancement in DDT-fed animals resulted from an increase in the enzyme content. Cholesterol and triglyceride fractions of brush border membranes were significantly elevated in insecticide-treated monkeys while sialic acid content was reduced. These findings link the oral toxicity of DDT to alterations in the brush border membranes of intestinal cells. [Presented at the 1979 annual meeting of Indian biochemists.]

81-2288. Abdulwajid, A. W.; Inamdar, A. N. (Dep. Biochem., Inst. Sci., Bombay 400032, India) **Isolation & purification of cadmium binding protein from freshwater fish.** *Indian J. Biochem. Biophys.* 17(4): 20; 1980.

A cadmium binding protein was separated from the cytosol fraction of liver and kidney homogenates of the freshwater fish *Tilapia mozambicus* by centrifugation at 105,000 × *g*. The protein was purified by Sephadex G-75 gel filtration and DEAE Sephadex A-25 ion-exchange chromatography. Cadmium binding proteins I and II were purified, and some of their physical properties are described. [Presented at the 1979 annual meeting of Indian biochemists.]

81-2289. Das, N.; Krishna Murti, C. R. (Ind. Toxicol. Res. Cent., Lucknow 226001, India) **Study of endosulfan toxicity in relation to protein status in the diet.** *Indian J. Biochem. Biophys.* 17(4): 21; 1980.

The effects of endosulfan (0.5 or 100 ppm/day) on female albino rats fed a low protein cereal diet or a normal protein diet was studied in 4-mo-feeding tests. Experimental rats on low protein diets showed retarded growth, increased abdominal fat, low hepatic protein and RNA levels and decreased levels of RBCs, WBCs and hemoglobin in the blood. An increase in hepatic glucose-6-phosphatase and hepatic and blood glutathione was also noted in these rats. Rats from the normoprotein group remained unaffected by endosulfan treatment, suggesting the importance of protein diet in relation to pesticide toxicity. [Presented at the 1979 annual meeting of Indian biochemists.]

81-2290. Ratha, B. K.; Ramanujam, S. N. (Sch. Life Sci., Dep. Zool., North-Eastern Hill Univ., Shillong 793014, India) **Toxicity studies of *Zanthoxylum alatum* on certain freshwater fishes.** *Indian J. Biochem. Biophys.* 17(4): 21; 1980.

The action of the piscicidal plant *Zanthoxylum alatum* on the water breathing fish, *Puntius shalynius* and the air breathing fish, *Heteropneustes fossilis*, was studied in laboratory tests. For *P. shalynius* the lethal threshold level of crude powder was 70 ppm and the 6 hr LC50 was 95 ppm, while for the alcoholic extract of the fruit, lethal threshold levels were 6 ppm and the 3 hr LC50 value was 7.5 ppm. In *H. fossilis*, the lethal threshold level and LC50 were greater, with different values for the 2 wt groups tested. The piscicidal components of the fruit also decreased levels of brain and muscle acetylcholinesterase. [Presented at the 1979 annual meeting of Indian biochemists.]

81-2291. Fawade, M. M.; Galdhar, N. R. (Biochem. Div., Chem. Dep., Marathwada Univ., Aurangabad 431004, India) **Effects of DDT on microsomal enzymes during vitamin A deficiency.** *Indian J. Biochem. Biophys.* 17(4): 22; 1980.

Changes in the levels of microsomal aminopyrine *N*-demethylase, acid phosphatase and cytochromes during DDT toxicity were examined in normal and vitamin A deficient rats. When DDT was administered to vitamin A-deficient rats, significant changes were found in both drug enzymes and cytochromes. Vitamin A deficiency alone resulted in decreased levels of aminopyrine *N*-demethylase acetanilide hydroxylase and cytochromes. Administration of DDT to normal rats caused increased levels of drug enzymes with no effect on acid phosphatase activity. [Presented at the 1979 annual meeting of Indian biochemists.]

81-2292. Mukhopadhyay, P. K.; Dehadrai, P. V. (Cent. Inland Fish. Res. Inst., ICAR, Barrackpore, India) **Biochemical changes in the air-breathing catfish, *Clarias batrachus* (Linn.) exposed to malathion.** *Indian J. Biochem. Biophys.* 17(4): 23; 1980.

The mechanisms of malathion toxicity which cause metabolic dysfunctions in the air-breathing teleost, *Clarius batrachus* L., were examined. Juvenile catfish exposed to 0.5 ppm malathion for 40 days showed a decreased incorporation of ^{14}C-lysine into hepatic protein which could not be recovered by higher dietary protein supplements. This subacute exposure to malathion caused increased total and differential leukocyte counts, and decreased RBC, hemoglobin, and hematocrit values. Marked increases in liver glycogen and significant increases in serum glucose and free amino acid levels were also observed. Malathion toxicity was correlated with effects on liver and gill esterase activities. Malathion accumulated in gills at a rate of 70.6 μg/g wet tissue. Comparisons were made of the present findings and published work on other biochemical tissue residues and toxicity thresholds. [Presented at the 1979 annual meeting of Indian biochemists.]

81-2293. Sharma, D. C.; Davis, P. S. (Dep. Med., Royal Adelaide Hosp., Univ. Adelaide, Adelaide, Australia) **Effect of methylmercury on protein synthesis in the liver of European carp *(Cyprinus carpio).*** *Indian J. Biochem. Biophys.* 17(4): 23; 1980.

European carp (*Cyprinus carpio*) were exposed to methylmercury at 50 ng/ml for 16 days. Hepatic protein synthesis as measured by the rate of *in vivo* leucine incorporation, was significantly reduced in exposed fish, while the levels of the free sulfhydral group were essentially unaffected. Mercury levels in fish livers were concentrated 900-fold. [Presented at the 1979 annual meeting of Indian biochemists.]

81-2294. Kaul, P. P. (Ind. Toxicol. Res. Cent., Lucknow, India) **Some neurochemical changes induced by *p,p'*-DDT.** *Indian J. Biochem. Biophys.* 17(4): 25; 1980.

Repeated dosing of rats with *p,p'*-DDT at levels below half the LD50 value had no effect on biogenic amines. Administration of 0.5 of LD50 resulted in a marked increase in the level of 5-hydroxyindole acetic acid (5-HIAA) in the brain stem, mid-brain, and hypothalamus. Pronounced fine tremors and hyperpyrexia were observed in rats 5 hr after treatment. Increases in 5-HIAA levels were directly proportional to increases in body temperature. Since increases in 5-HIAA reflect increases in serotonin turnover, it was suggested that an increased turnover rate of brain serotonin may be responsible for the hyperplexia induced by *p,p'*-DDT. [Presented at the 1979 annual meeting of Indian biochemists.]

81-2295. Agarwal, D. K. (Ind. Toxicol. Res. Cent., Lucknow 226001, India) **Effect of Di(2-ethylhexyl) phthalate & its metabolites on purified alcohol dehydrogenase (yeast).** *Indian J. Biochem. Biophys.* 17(4): 36; 1980.

The plasticizer and microchemical environmental pollutant, di(2-ethylhexyl phthalate) (DEHP; dioctyl phthalate) has been shown to interact with pentabarbitone, methaqualone, parathion, carbon tetrachloride, and ethanol. The DEHP metabolites, mono (2-ethylhexyl) phthalate (MEHP) produced significant inhibition of ethanol-induced sleeping time and activity of alcohol and aldehyde dehydrogenases. MEHP produced a non-competitive type of inhibition which was not significantly reversed by the addition of Zn. These results show that MEHP does not bind or extract Zn from the enzyme molecule to elicit its effect while playing an important role

in the interaction of DEHP with ethanol metabolism. [Presented at the 1979 annual meeting of Indian biochemists.]

81-2296. Hebbar, G.; Kachole, M. S. (Biochem. Div., Chem. Dep., Marathwada Univ., Aurangabad 431004, India) **Ascorbate & the effect of inducers on hepatic mixed function oxidase system.** *Indian J. Biochem. Biophys.* 17(4): 53; 1980.

The effects of phenobarbital, DDT, and 3-methylcholanthrene (3-MC) treatment alone and in combination with ascorbic acid on the hepatic mixed function oxidase system have been studied. Ascorbic acid treatment before or after phenobarbital or DDT treatment caused increased activities of drug metabolizing enzymes with a greater than additive effect. Ascorbic acid administration after 3-MC treatment increased enzyme activities with a less than additive effect. These findings suggest that ascorbic acid acts as a nonspecific inducer of the hepatic mixed function oxidase system and that the inducer proper determines the specificity of the induced system. [Presented at the 1979 annual meeting of Indian biochemists.]

81-2297. Anand, M.; Sur, R. N.; Khanna, R. N.; Gopal, K.; Gupta, G. S. D. (Ind. Toxicol. Res. Cent., Lucknow 226001, India) **Effect of endosulfan on bioelectrical activity of brain in rats.** *Indian J. Biochem. Biophys.* 17(4): 74; 1980.

Endosulfan administered to rats at 5 mg/kg ip for 10 days caused remarkable changes in the bioelectrical activity of the brain cortex. Rhythmic bursts of spikes and waves of seizure patterns were observed 25-30 min after pesticide dosing and continued for 60 min. Clonic convulsions were more prominant over the head region with localization in the upper extremities. Levels of endosulfan in the brain were correlated with the electrical patterns observed. [Presented at the 1979 annual meeting of Indian biochemists.]

81-2298. George, S. T.; Balasubramanian, A. (Neurchem. Lab., Christian Med. Coll. & Hosp., Vellore 632004, India) **Association of multiple forms of serotonin-sensitive arylacylamidase with acetylcholinesterase.** *Indian J. Biochem. Biophys.* 17(4): 77; 1980.

Serotonin-sensitive arylacylamidase has been associated with multiple forms of true cholinesterase from such diverse sources as sheep basal ganglia, human erythrocytes, and *Electrophorus electricus.* The aggregation property of acetylcholinesterase was used to separate multiple molecular forms of the enzyme by gel filtration and polyacrylamide gel electrophoresis. Aryl acylamidase activity coincided with acetylcholinesterase activity and was basically in the same ratio in all different forms of the enzyme peaks. Acetylcholinesterase inhibitors also inhibited aryl acylamidase. The enzymes were purified by affinity chromatography and were examined. [Presented at the 1979 annual meeting of Indian biochemists.]

81-2299. Gupta, P. K.; Srivastava, S. C. (Ind. Toxicol. Res. Cent., Lucknow 226001, India) **Effect of endosulphan on male reproductive organs in rats.** *Indian J. Biochem. Biophys.* 17(4): 102-103; 1980.

When adult male albino rats were given oral doses of endosulfan at three levels (0.625, 2.5, and 5.0 mg/kg) in groundnut oil for 58 days, no changes in body wt or testicular wt were observed. At the two higher dose levels, the wt of the epididymis, seminal vesicles, coagulating glands and ventral prostates were decreased. Also at the higher endosulfan doses, the fructose content in the coagulating glands was reduced and the number and speed of motility of spermatozoa were decreased. The alkaline phosphatase activity of the ventral prostates was reduced by all three dose levels, suggesting the action of endosulfan on the androgenic functions of male rats. [Presented at the 1979 annual meeting of Indian biochemists.]

81-2300. Bhatnagar, V. K.; Khemani, L. D.; Malviya, A. N. (Biochem. Dep., S. N. Med. Coll., Agra 282002, India) ***In vitro* inhibition of lactate dehydrogenase activity upon pesticide toxicity.** *Indian J. Biochem. Biophys.* 17(4): 104-105; 1980.

The kinetics of lactate dehydrogenase (LDH) were examined in rat liver homogenates treated with DDT, malathion or a combination of the two at levels of 65.6 μg/mg to 6.5 mg/mg protein. Solutions of DDT, malathion, and their combination made up with absolute alcohol all inhibited LDH activity. Both V_{max} and K_m increased with increasing levels. K_i values were also calculated. The *in vitro* effects were compared to results of studies on the *in vivo* inhibition of LDH. [Presented at the 1979 annual meeting of Indian biochemists.]

81-2301. Misra, R.; Srivastava, N.; Misra, U. K.; Venkitasubramanian, T. A. (Dep. Biochem., Vallabhbhai Patal Chest Inst., Univ. Delhi, Delhi 110007, India) **Interaction of protein nutrition & endosulphan treatment on aniline hydroxylase activity of liver SER of rats.** *Indian J. Biochem. Biophys.* 17(4): 107-108; 1980.

The interaction of protein nutrition and endosulfan on the activity of aniline hydroxylase in hepatic smooth endoplasmic reticulum (SER) of rats was examined. The results revealed that the activity of this enzyme was reduced by about 3-fold in SER of rats fed the deficient rice diet as compared to rats fed the supplemented rice diet. No such effect was noted on the activity of aniline hydroxylase in liver rough ER (RER). Administration of endosulfan to

rats, fed either the deficient and the supplemented rice diet, caused increased activity of aniline hydroxylase by several fold in the liver SER. No such effect was noted in liver RER. Endosulfan treatment abolished the increased levels of triglycerides observed in liver SER and RER of rats fed the deficient rice diet. It appears that the effect of endosulfan is at the ribosomal level. [Presented at the 1979 annual meeting of Indian biochemists.]

81-2302. Joshi, S.; Tewari, C. P. (Dep. Biochem., Lucknow Univ., Lucknow 226007, India) **Biochemical studies on simazine toxicity in male mice.** *Indian J. Biochem. Biophys.* 17(4): 111; 1980.

Male adult albino mice, when injected ip with 5 mg/kg of simazine, showed decreased levels of glutamate oxaloacetate transaminase (GOT) and increased levels of glutamate pyruvate transaminase (GPT) in liver. Levels of GOT increased in the kidney while levels of aldolase increased in the liver. Alkaline phosphatase levels were significantly decreased in both the brain and liver. Significant increases in hepatic peroxidation and evidence of hepatic membrane damage and release of enzymes into the serum were also observed. [Presented at the 1979 annual meeting of Indian biochemists.]

81-2303. Srinivasan, K.; Radhakrishnamurty, R. (Discipline Biochem. & Appl. Nutr., Cent. Food Technol. Res. Inst., Mysore 570013, India) **Effect of β- & γ-isomers of hexachlorocyclohexane on some enzyme systems of albino rats.** *Indian J. Biochem. Biophys.* 17(4): 111; 1980.

Rats fed β- and γ-BHC (lindane) at 800 ppm for 2 wk showed decreased levels of hepatic mitochondrial DNP/Mg^{2+}/Ca^{2+}- activated ATPases and microsomal Na^+,K^+-activated ATPases. Reductions in hepatic MDH and LDH activities were also observed, while levels of SDH were elevated. Both isomers caused increases in serum alkaline phosphatase and SGPT activities and decreases in serum acid phosphatase activity. BHC isomer-induced changes in plasma specific enzymes suggested hepatic toxicity. Levels of rat serum albumins tended to decrease and serum globulins increase after feeding with either BHC-isomer. [Presented at the 1979 annual meeting of Indian biochemists.]

81-2304. Gopal, K.; Khana, R. N.; Anand, M.; Gupta, G. S. D. (Ind. Toxicol. Res. Cent., Lucknow 226001, India) **Hematological study in the assessment of the endosulphan toxicity for fish.** *Indian J. Biochem. Biophys.* 17(4): 111; 1980.

Catfish (*Clarias batrachus*) exposed to sublethal levels (0.002-0.01 ppm) of endosulfan showed significant increases in RBC counts, hemoglobin content and packed cell volume 10 days after laboratory exposure to the insecticide. Measurements of mean cell volume revealed swelling and shrinkage at exposure to 0.01 ppm and 0.002 ppm endosulfan, respectively. Slight deviations from normal coagulation times were also observed. [Presented at the 1979 annual meeting of Indian biochemists.]

81-2305. Garg, A.; Kunwar, K. (Ind. Toxicol. Res. Cent., Lucknow 226001, India) **Endosulphan intoxication - blood glucose, plasma electrolytes, Ca levels & hexokinase in rats.** *Indian J. Biochem. Biophys.* 17(4): 113; 1980.

The effects of acute and subacute doses of endosulfan on blood glucose, plasma electrolytes, and hexokinase were studied in 12 hr fasted male rats. A single 40 mg/kg oral dose of endosulfan significantly increased blood glucose after 2 hr. No effects on brain hexokinase were observed. Repeated dosing with endosulfan (0.625-20 mg/kg) for 7 wk had no effect on plasma electrolytes. At repeated dosing with 20 mg/kg, endosulfan caused slight increases in blood glucose levels. Plasma Ca was significantly decreased by a maximum of 35% 4 hr after endosulfan treatment. The possible role of blood glucose and plasma Ca and electrolytes in endosulfan toxicity is discussed. [Presented at the 1979 annual meeting of Indian biochemists.]

81-2306. Das, N.; Garg, A.; Gupta, P. K. (Ind. Toxicol. Res. Cent., Lucknow 226001, India) **Endosulphan-induced alterations in glutathione & ascorbate in male rats.** *Indian J. Biochem. Biophys.* 17(4): 113-114; 1980.

The effects of an ip dose of endosulfan (40 mg/kg body wt) on rat blood, brain, and hepatic ascorbic acid and glutathione levels were examined 1, 2 and 4 hr after dosing. At 1 hr, hepatic glutathione levels decreased and then increased again after 4 hr. At 4 hr, the blood and brain glutathione levels were increased by 50 and 43%, respectively. During the first and second hr, total ascorbate was slightly increased with a constant ascorbate/dehydroascorbate ratio. A slight decrease in total ascorbate occurred at 4 hr, with rapid decreases in the ascorbate/dehydroascorbate ratio. Over the 4 hr period, blood ascorbic acid slowly increased by 19%. These findings suggest an increased utilization of ascorbic acid to maintain glutathione in the reduced form for use in endosulfan detoxification. [Presented at the 1979 annual meeting of Indian biochemists.]

81-2307. Saxena, M. C.; Bharagava, A. K.; Siddiqui, M. K. J.; Seth, T. D. (Ind. Toxicol. Res. Cent., Lucknow 226001, India) **Role of organochlorine compounds in premature labour and still-births.** *Indian J. Biochem. Biophys.* 17(4): 114; 1980.

Due to the effects of organochlorine compounds on progesterone-estrogen levels, residues of these com-

pounds were examined in 40 cases of premature deliveries and stillbirths. Organochlorine levels were determined in maternal blood, placental tissue, and umbilical cord from normal and abnormal deliveries by gas liquid chromatography with electron capture detection. The higher levels of organochlorine compounds found in samples from abnormal deliveries suggest that these compounds play a significant role in premature labor and stillbirths. The possible relationships of organochlorine pesticides to the incidence of premature labor and stillbirthare discussed. [Presented at the 1979 annual meeting of Indian biochemists.]

81-2308. Prasad, A. R. K.; Datta, K. (Sch. Environ. Sci., Jawaharlal Nehru Univ., New Delhi 110067, India) **Induction of metallothionein in cadmium-treated chick embryo.** *Indian J. Biochem. Biophys.* 17(4): 114; 1980.

Cadmium chloride (0.125-10 μmol/kg/egg) was injected into the yolk sac of fertilized chicken eggs during different stages of development. The biosynthesis of the cadmium binding protein, metallothionein, was also examined in livers of 14-day-old chick embryos after a single injection of cadmium chloride (10 μmol/kg/egg). Active biosynthesis of metallothionein occurred in the livers of cadmium exposed chick embryos. However, actinomycin D treatment did not inhibit this synthesis, suggesting translational regulation of metallothionein formation. Chick embryo mortality rate after cadmium exposure and actinomycin D treatment was examined to correlate metallothionein biosynthesis with the observed toxicity. [Presented at the 1979 annual meeting of Indian biochemists.]

81-2309. Chrzanowski, R. L.; Jelinek, A. G. (Biochem. Dep., Exp. Stn., E. I. du Pont de Nemours & Co. Inc., Wilmington, DE 19898) **Metabolism of phenyl carbon-14-labeled *O*-ethyl *O*-(4-nitrophenyl) phenylphosphonothioate in the rat and in hens at toxic and subtoxic dose levels.** *J. Agric. Food Chem.* 29(3): 580-587; 1981 (12 references).

Differences in the rate of metabolism of EPN in the hen and rat have been observed. Unmetabolized EPN was found in the feces of hens dosed at 4 and 50 mg/kg, whereas none could be found from a rat dosed at 17 mg/kg. When a single subtoxic oral dose was given to either rat or hen, most of the radioactivity was eliminated within 72 hr as *O*-ethylphenylphosphonothioic acid, *O*-ethylphenylphosphonic acid, *O*-ethyl-4-hydroxyphenylphosphonic acid, *O*-ethyl-3-hydroxyphenylphosphonic acid, phenylphosphonothiolic acid, and phenylphosphonic acid, However, when a toxic dose of EPN was given to atropinized hens, unmetabolized EPN was found to represent a significant portion of the residual radioactivity in all tissues after 72 hr. The synthesis of [^{14}C]EPN and its metabolites is also described. (Author abstract reprinted by permission of the American Chemical Society)

81-2310. Hollingshaus, J. G.; Nishioka, T.; March, R. B.; Fukuto, T. R. (Div. Toxicol. & Physiol., Dep. Entomol., Univ. California, Riverside, CA 92521) **Effect of impurities on the delayed neurotoxicity of *O*-(4-bromo-2,5-dichlorophenyl) *O*-ethyl phenylphosphonothioate administered orally to hens.** *J. Agric. Food Chem.* 29(3): 593-600; 1981 (21 references).

The delayed neurotoxicity of technical and purified *O*-(4-bromo-2,5- dichlorophenyl) *O*-ethyl phenylphosphonothioate administered orally to hens was compared under different conditions. The technical material was neurotoxic at 750 mg/kg while the purified compound was neurotoxic at 1000-1250 mg/kg. The chemical composition of the technical material was analyzed for organophosphate contaminants. Impurities present as more than 0.1% were examined for delayed neurotoxic activity. *O,O*-Diethylphenylphosphonothioate, its oxon analog, and *O,O*-diethyl(4- chlorophenyl)phosphonothioate were 5-10 times more potent as delayed neurotoxins than the parent compound. These impurities evidently potentiate the delayed neurotoxicity of ethyl leptophos and may potentiate the delayed neurotoxicity of other *O*-ethyl phenylphosphonothioate pesticides as well. (Author abstract reprinted by permission of the American Chemical Society)

81-2311. Clark, D. E.; Ivie, G. W.; Camp, B. J. (Vet. Toxicol. & Entomol. Res. Lab., Agric. Res., SEA, USDA, College Station, TX 77840) **Effects of dietary hexachlorobenzene on *in vivo* biotransformation, residue deposition, and elimination of certain xenobiotics by rats.** *J. Agric. Food Chem.* 29(3): 600-608; 1981 (42 references).

The effect of hexachlorobenzene (HCB) pretreatment of male albino rats on the *in vivo* biotransformation, residue deposition, and elimination of radiocarbon-labeled aldrin, 1-naphthol, DDT, HCB, and mirex was investigated. In rats pretreated with 250 ppm of dietary HCB for 4 wk, the percentage of ^{14}C associated with the more polar urinary metabolites was either increased (aldrin; mirex), decreased (HCB), or unchanged (DDT; 1-naphthol). There was no evidence of qualitative changes in biotransformation of any of the five ^{14}C-labeled test compounds that could be attributed to HCB pretreatment. Rats fed the HCB diet and subsequently treated with [^{14}C]aldrin retained less radiocarbon residues in adipose and kidney tissue than comparably treated control rats retained, whereas rats fed the HCB diet and subsequently treated with [^{14}C]DDT or [^{14}C]mirex retained more radiocarbon residues in their adipose tissue than control rats retained. There were no differences due to HCB pretreatment in tissue radiocarbon residues of rats treated with [^{14}C]HCB or [^{14}C]1-naphthol. Excretion rates of radiocarbon in HCB-diet rats were enhanced after treatment with each of the radiocarbon-labeled compounds. Rats fed the HCB diet gained more body wt than controls during the 4-wk pre-treatment period but subsequently lost more wt than controls during the 2 wk post-treatment. (Author abstract reprinted by permission of the American Chemical Society)

81-2312. Kirkpatrick, D.; Finn, C. M.; Conway, B.; Hawkins, D. R.; Honda, T.; Ishida, M.; Powell, G. P. (Dep. Metab. & Pharmacokinet., Huntingdon Res. Cent., Huntingdon PE18 6ES, England) **Biokinetics and metabolism of *N*-(2,3-dichlorophenyl)-3,4,5,6-tetrachlorophthalamic acid in rats.** *J. Agric. Food Chem.* 29(3): 608-614; 1981 (7 references).

The biokinetics and metabolism of the bactericide *N*-(2,3-dichlorophenyl) -3,4,5,6-tetrachlorophthalamic acid, techlofthalam, have been studied in rats after repeated oral doses of the ^{14}C-labeled compound for 7 days. Up to 6 days after the last of 7 daily doses, means of 92 and 66% of the total dose were excreted in the feces of male and female rats, respectively, and means of 5 and 25%, respectively, in the urine. Only 0.2% dose was retained in the carcasses at this time. There was no extensive accumulation of radioactivity in tissues. Techlofthalam was metabolized by hydroxylation in the dichloroaniline group, and this metabolite was eliminated as a conjugate in bile and also partly unconjugated in the urine of female rats. No metabolites resulting from amide hydrolysis were detected. An oral dose of techlofthalam imide was excreted almost entirely unchanged in feces, indicating a very low absorption of this compound. (Author abstract reprinted by permission of the American Chemical Society)

81-2313. Kubota, S. S.; Ochiai, T.; Akeda, S. (Fac. Fish., Mie Univ., Tsu, Japan) **Ultrastructural study of inclusion-like bodies in hepatocytes of *Cyprinus carpio* L. induced by the herbicide benthiocarb.** *J. Fish Dis.* 4(1): 77-81; 1981 (5 references).

Four cultured carp were exposed to 300 *l* of 1.5 ppm benthiocarb (thiobencarb) solution for 21 days. Light microscopy examination of hepatocytes revealed the presence of inclusion-like bodies in all 4 fish. One to three, or rarely four, bodies were noted in a hepatocyte. The bodies were morphologically spherical or oval; their size ranged from 1 to 5 μm, averaging 2-3 μm. Electron microscopy was used to observe the fine structure of the inclusion-like bodies. The wall of the bodies consisted of multiple layers of paired membranes. These membranes were aligned at intervals of about 100 nm. Fine granules were attached to the surface of the membranes. The contents consisted of one to several fat droplets and occasional micro-organelles. Bands of multiple layers with granules were noted along the cell wall membrane. Mitochondria in the hepatocytes were pushed to the margin of the cells. Many fat droplets were also present without a membranous wall. Glycogen granules were prominent in the hepatocytes. The findings suggest that the myelin-like membranous whorls consist of endoplasmic reticulum, and that the granules attached to the surface of the membrane are ribosomes. Benthiocarb may have induced extensive proliferation of rough endoplasmic reticulum in hepatocytes of the carp. It is suggested that the inclusion-like body may be a form of intracellular defense against benthiocarb.

81-2314. Malpiece, Y.; Sharan, M.; Barbotin, J. N.; Personne, P.; Thomas, D. (Lab. Technol. Enzymatique, Univ. Technol. Compiegne, F-60206 Compiegne, France) **Kinetic, computer, and electron microscopic studies dealing with an artificial enzyme membrane: theoretical and experimental evaluation of the cytochemical demonstration of acetylcholinesterase.** *J. Histochem. Cytochem.* 29(5): 633-643; 1981 (28 references).

A model system is used to theoretically and experimentally evaluate the cytochemical demonstration of acetylcholinesterase (AChE). The model system is based on AChE being immobilized by glutaraldehyde inside artificial protein membranes. The kinetics of the copper-thiocholine histochemical method were studied to produce a computer simulation. In addition, electron microscopy results are presented. It is concluded that the system is ruled by diffusional constraints, and there is no geometrical similarity between the active size distribution and the precipitate repartition.

81-2315. Walters, K. A.; Dugard, P. H.; Florence, A. T. (Cent. Toxicol. Lab., ICI Ltd., Alderley Park, Cheshire, England) **Non-ionic surfactants and gastric mucosal transport of paraquat.** *J. Pharm. Pharmacol.* 33(4): 207-213; 1981 (21 references).

Female, New Zealand, white rabbits were used for *in vitro* studies on the effects of non-ionic surfactants on the gastric mucosal transport of paraquat. The dialysis experiments indicated that no significant interaction occurred between paraquat and surfactants. Data on the transfer of paraquat suggest that no active or facilitated processes occurred during paraquat absorption by the isolated fundic mucosa of the rabbit. It seemed likely that absorption occurred by simple passive diffusion. The overall mean permeability constant of paraquat through the gastric mucosa of rabbit was 9.0×10^{-3} cm/hr from a 1 mg/ml paraquat ion donor solution. In the presence of surfactants of varying lipophilic and hydrophilic character, the permeability constant of paraquat was altered, depending on the concentration of surfactants. Even at 0.001%, several surfactants caused a significant increase in the rate of paraquat transfer but the increase in permeability at all concentrations of surfactant did not appear to be simply related to any of the physicochemical properties of the surfactants. The most effective promotor of absorption was Brij 36T ($C_{12}E_{10}$).

81-2316. Graham-Bryce, I. J.; Hollomon, D. W.; Lewis, T. (Insect. & Fungic. Dep., Rothamsted Exp. Stn., Yarnton, England) **Pest and disease control in cereals: a research viewpoint.** *J. R. Agric. Soc. Engl.* 140: 131-139; 1979 (31 references).

Increased pesticide use in the United Kingdom is discussed. Dangers of unwise use of pesticides and fungicides include the development of resistance and

damage to non-target organisms. The problem of aphid resistance to insecticides can render established insecticides ineffective at economic rates. Resistance mechanisms may affect a wide range of compounds and interact in complex ways. Resistance to alternative compounds may also develop. Resistance can be detected through examination of insecticide degrading enzymes; field samples of aphids are being cloned and gel electrophoresis is used to monitor for signs of resistance. Resistance to fungicides is also of concern; however, no fungicides have been withdrawn from use on cereals due to widespread resistance. Harmful effects on beneficial organisms such as predatory ground beetles and earthworms may also occur. The decline of some insects preferred as food by gray partridge chicks has been suggested to be related to pesticide application; herbicides may have destroyed weeds carrying insects at the pecking level of the chicks.

81-2317. Umetsu, N.; Mallipudi, N. M.; Toia, R. F.; March, R. B.; Fukuto, T. R. (Div. Toxicol. Physiol., Dep. Entomol., Univ. California, Riverside, CA) **Toxicological properties of phosphorothioate and related esters present as impurities in technical organophosphorus insecticides.** *J. Toxicol. Environ. Health* 7(3-4): 481-497; 1981 (17 references).

In several technical preparations of malathion and other organophosphorus insecticides, *O,O,S*-trimethyl phosphorothioate is present as an impurity. When this impurity was administered orally to rats in single doses as low as 15 mg/kg, delayed mortality resulted with death occurring 4-22 days after treatment. Mice also demonstrated delayed toxicity, but were in general less sensitive than rats. *O,O,S*-triethyl phosphorothioate and *O,S,S*-trimethyl phosphorodithioate induced the same signs of intoxication at slightly higher dose levels. Rats treated with *O,O,S*-trimethyl phosphorothioate refused food and water within 24 hr and did not eat or drink again before they died. Intoxication was not blocked nor reduced by injections of nutrient solution or atropine. The isomers *O,O,O*-trimethyl phosphorothioate was a potent antagonist of the toxicity of *O,O,S*-trimethyl phosphorothioate. As little as 1% of the former isomer protected rats from the toxic effects of the latter isomer at doses as high as 200 mg/kg. Rat serum carboxylesterase and cholinesterase were inhibited for prolonged periods after a single oral dose of *O,O,S*-trimethyl phosphorothioate, but the duration of inhibition was significantly less when the toxicant contained 1% *O,O,O*-trimethyl isomer.

81-2318. Curtis, L. R.; Thureson-Klein, A. K.; Mehendale, H. M. (Dep. Pharmacol. Toxicol., Univ. Mississippi, Med. Center, Jackson, MS) **Ultrastructural and biochemical correlates of the specificity of chlordecone-potentiated carbon tetrachloride hepatotoxicity.** *J. Toxicol. Environ. Health* 7(3-4): 499-517; 1981 (34 references).

Male Sprague-Dawley rats were given a 15 day dietary exposure to 10 ppm chlordecone, mirex, or photomirex as the pretreatment protocol. On day 15 of the chlorocarbon pretreatment, rats received either corn oil vehicle or carbon tetrachloride (0.05 mg/kg); animals were sacrificed 24 hr later. Chlordecone, mirex, and photomirex ingestion was calculated as about 11 mg/kg/15 days for each group. No signs of toxicity were present during this pretreatment stage. Administration of carbon tetrachloride to the chlordecone-fed rats caused a 38-fold increase in plasma ornithine carbamoyl transferase activity and a 64% decrease in hepatic cytochrome P-450. Extreme ultrastructural changes were also noted in these rats. Many hepatocytes were necrotic, and others showed lipid accumulation. Dilation of endoplasmic reticulum and swelling of mitochondria were prevalent. Carbon tetrachloride alone, photomirex + carbon tetrachloride, and mirex + carbon tetrachloride produced similar changes in a few hepatocytes; the low incidence of these structural aberrations were consistent with the biochemical data. Thus the propensity of chlordecone to potentiate carbon tetrachloride hepatotoxicity cannot be directly associated with some commonly measured indices of hepatic microsomal MFO activity.

81-2319. Nelson, J.; MacKinnon, E. A.; Mower, H. F.; Wong, L. (Hawaii Epidemiol. Stud. Program, Pacific Biomed. Res. Cent., Univ. Hawaii, Honolulu, HI) **Mutagenicity of *N*-nitroso derivatives of carbofuran and its toxic metabolites.** *J. Toxicol. Environ. Health* 7(3-4): 519-531; 1981 (21 references).

Preparation of *N*-nitroso derivatives of carbofuran, 3-hydroxycarbofuran, and 3-ketocarbofuran was undertaken by reaction with nitrite under acidic conditions. Products were obtained by extraction, identified by thin-layer chromatography and purified by silica gel column chromatography. Gries reagent gave positive reactions with all 3 nitroso derivatives. The characteristic triplet absorption spectra of 387, 402, and 422 nm was observed in each case. Nuclear magnetic resonance and mass spectroscopy yielded structural confirmation. The Ames assay method with *Salmonella typhimurium* strains TA98 and TA100 showed that all three derivatives responded similarly; a mutation ratio of 45 at 5 μg/plate was observed on TA100. All 3 produced chromosome aberrations in Chinese hamster ovary cells. Two (nitrosocarbofuran and 3-hydroxynitrosocarbofuran) induced large numbers of sister chromatid exchanges in the same cells. Observed variations in maximum mutagenicity in the Ames test and the ability to induce sister chromatid exchanges in Chinese hamster ovary cells are consistent findings with the stability of the compounds in aqueous solution.

81-2320. Leyck, S.; Freundt, K. J. (Inst. Pharmacol. Toxicol., Fac. Clin. Med. Mannheim, Univ. Heidelberg, BRD) **Thiram-induced disturbance of microsomal phospholipid bioformation and phospholipid fatty acid pattern.** *J. Toxicol. Environ. Health* 7(3-4): 533-545; 1981 (45 references).

Female SPF Wistar rats were given 30 mg/kg and 1 g/kg thiram suspended in 5% (w/v) sucrose and 5% (w/v) gum arabic in tap water by oral intubation. A significant prolongation of the hexobarbital sleeping time or zoxazolamine paralysis time was produced by the 30 mg or 1 g thiram/kg doses, respectively. A depression of hepatic microsomal *O*-demethylation of *p*-nitroanisole to *p*-nitrophenol, and a decrease in the microsomal cytochrome P-450 content, were also noted. Incorporation of C-14 activity from glucose, glycerol, and palmitic acid into phospholipids decreased in most components; a compensatory increase was observed in several. Phosphatidylcholine or phosphatidylethanolamine molecules had increased or decreased fatty acid concentrations from one fatty acid class to the other. The total fatty acid content in phosphatidylcholine or phosphatidylethanolamine was significantly decreased only after 1 g/kg thiram. This was associated with an increase in total unsaturated fatty acids. Multiple changes in the bioformation and composition of microsomal membrane phospholipids suggest a disturbance of the monooxygenase system. An interrelationship between the observed impairment and the inhibitory effect of thiram on the microsomal monooxygenases is suggested.

81-2321. Zinki, J. G.; Jessup, D. A.; Bischoff, A. I.; Lew, T. E.; Wheeldon, E. B. (Dep. Clin. Pathol., Sch. Vet. Med., Univ. California, Davis, CA 95616) **Fenthion poisoning of wading birds.** *J. Wildl. Dis.* 17(1): 117-119; 1981 (6 references).

Seven dead snowy egrets and 2 dead great egrets were recovered from an active dredge spoil site and an adjacent slough near the city of Vallejo, California on April 4, 1979. Necropsies of the dead birds revealed no significant lesions. Extremely low serum and brain ChE activities suggested that the birds were poisoned by a ChE inhibiting insecticide. It is likely that the inhibition was > 50%. Fenthion was detected in the water from the area where the birds were found. Stomach contents analysis also indicated fenthion. It is concluded that the birds could have been exposed to very high concentrations; residue levels in the water were 16 μg/l 2 days after the area had been sprayed with the recommended level for mosquito control of 0.11 kg fenthion/ha. It is calculated that this application rate would produce a concentration of 147 μg/l in water 15 cm deep.

81-2322. Roslavtseva, S. A.; Didenko, L. N. (All-Union Res. Inst. Chem. Means Plant Prot., Leningrad, USSR) **Rezistentnost' vreditelei zapasov k insektitsidam i fumigantam. [Resistance of stored product pests to insecticides and fumigants.]** *Khim. Sel'sk. Khoz.* 19(3): 35-39; 1981 (36 references) (Russian).

Literature data on resistance of stored products pests to insecticides and fumigants are reviewed. In 1975, resistance to lindane and malathion was recorded in 87 and 78 countries surveyed, respectively. Mechanism of resistance was shown to be associated with esterase activity: resistant *Plodia interpunctella* strains were found to have 13 esterase isozymes, compared with 9 isozymes in susceptible strains. Insecticide resistance was recorded predominantly for weevils and flour beetles.

81-2323. Ghosh, P.; Ternai, B.; Whitehouse, M. (Raymond Purves Res. Lab., Univ. Sydney, R. N. Shore Hosp., St. Leonards, New South Wales 2065, Australia) **Benzofurans and benzofuroxans: biochemical and pharmacological properties.** *Med. Res. Rev.* 1(2): 159-187; 1981 (126 references).

A detailed study of the biochemical and pharmacological properties of benzofurans (BFZ) and benzofuroxans (BFX) is presented. The nomenclature and structure of a large number of these compounds are discussed. Biologically important reactions are outlined. The formation of relatively stable Meisenheimer complexes is an important step during substitution reactions. The physiological properties of BFZs and BFXs that are discussed include antiproliferation, immunosuppression and mutagenicity, as well as the effects on the central nervous system. These compounds are used in herbicides, fungicides, algicides and in compounds that have antimicrobial activity. Generally, oxygen analogs of substituted 2,1,3-benzothiadiazole, in which the benzene ring is mono- or disubstituted by halogen, cyano, thiocarbamoyl or thioalkyl groups, are used in the pesticides. The parent BFZ or BFX compounds are generally less toxic than the corresponding substituted compound.

81-2324. Waltner-Toews, D. (Ontario Vet. Coll., Univ. Guelph, Guelph, Ontario, Canada) **Organophosphate poisoning and hemobartonellosis in a cat.** *Mod. Vet. Pract.* 62(1): 48; 1981 (3 references).

A case is discussed in which a flea medallion, containing the organophosphate dichlorvos and related chemicals, was used on a cat suffering from fleas. In addition, a compound containing pyrethrins, piperonyl butoxide, and carbaryl was sprayed in the house and on the cat's lower back. Within 3 days the cat developed diarrhea, ataxia, and a slow, irregular and weak heartbeat. The cat appeared normal following removal of the flea medallian and treatment with atropine sulfate. However, 36 hr after apparent recovery, diarrhea again developed, along with dilation of the pupils and pale mucous membranes. A hemogram showed a PCV of 14% and a hemoglobin level of 5.21 g/dl. *Hemobartonella felis* was found in the blood

smear. The hemobartonella was regarded as being secondary to the stress of organophosphate poisoning, and treatment with oral tetracycline, an anabolic steroid, a corticosteroid, and a multinutrient supplement was successful. The case reflects the need for carefully instructing clients about the use of insecticides on or near animals.

81-2325. Riviere, J. E.; Boosinger, T. R.; Everson, R. J. (Anim. Dis. Diagn. Lab., Purdue Univ., West Lafayette, IN 47906) **Inorganic arsenic toxicosis in cattle. A review of selected cases.** *Mod. Vet. Pract.* 62(3): 209-211; 1981 (18 references).

Several cases of arsenic poisoning in cattle are discussed. Nine adults confined to a concrete-floored pen developed acute hemorrhagic diarrhea. Two died within 48 hr after onset of symptoms. Necropsy revealed severe intestinal lesions suggesting toxic enteritis. Arsenic was determined in various tissues by colorimetric methods. Levels were 10.1-17.0 ppm in reticulum, 4.85 ppm in kidney tissues and 3.78 ppm in liver samples. A feed supplement, which had been fed to the cattle, was found to contain 5.50 ppm arsenic. A brief review of other cases of arsenic poisoning was presented. One of the previous cases involved cattle grazing on a pasture which had been recently sprayed with an arsenical pesticide, resulting in renal arsenic concentrations of 2.6-12.6 ppm.

81-2326. Autor, A. P.; McLennan, G.; Fox, A. W. (Dep. Pharmacol., Iowa Univ., Iowa City, IA 52242) **Oxygen free radicals generated by dihydroxyfumarate and ionizing radiation: cytotoxic effect on isolated pulmonary macrophages.** In: *Molecular Basis of Environmental Toxicity.* Bhatnagar, R. S., ed. (Ann Arbor Sci. Publ. Inc.: Ann Arbor, MI): CH03: 51-67; 1980 (57 references).

Several xenobiotics, including the herbicide paraquat, can react with oxygen to produce highly reactive oxygen radicals. The internal organ most vulnerable to such altered chemicals in the environment is the lung. Pulmonary toxicity of a variety of toxic agents has been associated with damage to specific cells within the lung parenchyma. Studies were done using dihydroxyfumarate to provide a chemical source for the oxygen free radical at physiologic pH. Exposure to ionizing radiation was used as a second, physical source of oxygen radicals in aqueous solution. The effects of oxygen radicals so generated on rat pulmonary macrophages were investigated. Pulmonary macrophages, incubated with concentrations of dihydroxyfumarate ranging from 180-720 μg/ml showed a significant loss of viability after 2 hr which was dependent on dihydroxyfumarate concentration. When incubated with 400 μg/ml of dihydroxyfumarate, adult pulmonary macrophages showed a progressive loss of viability over a 5 hr incubation period. Results obtained indicate that an important consideration in identifying the mechanism of toxicity of the oxygen radical generating system is to distinguish the difference between extracellular and intracellular generation of oxygen radicals. Results obtained with the physical source of oxygen radicals were quite similar. It is concluded to be unlikely that the organic intermediates or products of dihydroxyfumarate autoxidation caused the observed toxicity.

81-2327. Svingen, B. A.; Aust, S. D. (Dep. Biochem., Michigan State Univ., East Lansing, MI 48824) **The mechanism of NADPH-dependent and $O_2^{\cdot-}$-dependent lipid peroxidation.** In: *Molecular Basis of Environmental Toxicity.* Bhatnagar, R. S., ed. (Ann Arbor Sci. Publ. Inc.: Ann Arbor, MI): CH04: 69-110; 1980 (94 references).

Evidence to support a proposed unified mechanism of NADPH-dependent and superoxide-dependent lipid peroxidation is presented. The results indicate that NADPH-dependent and superoxide-dependent peroxidation of microsomal phospholipid occur by the same mechanism. Lipid peroxidation is proposed to consist of 2 sequential steps. The first step, initiation, involves the formation of low levels of a lipid hydroperoxide (LOOH) in previously unperoxidized lipid. The second step, propagation, is the breakdown of initially formed LOOH generating reactive intermediates of lipid peroxidation. The initiation of NADPH-dependent lipid peroxidation was not dependent on the nonenzymatic dismutation of superoxide to give rise to singlet oxygen or further reaction of the dismutation products to generate the hydroxyl radical. The type of damage considered characteristic of *in vivo* lipid peroxidation may only be noted after lipid peroxidation has entered the propagation step and become rampant. Lipid peroxidation undergoing propagation may result in the loss of membrane integrity and function of membrane proteins. Such damage can result in lysosomal lysis, loss of mitochondrial function, loss of cellular reduction power (NADPH, NADH and GSH) and even eventual cell lysis and death. The involvement of superoxide-dependent lipid peroxidation in paraquat toxicity has been demonstrated.

81-2328. Hammock, B. D.; Gill, S. S.; Mumby, S. M.; Ota, K. (Div. Toxicol. Physiol., Dep. Entomol., Univ. California, Riverside, CA 92521) **Comparison of epoxide hydrases in the soluble and microsomal fractions of mammalian liver.** In: *Molecular Basis of Environmental Toxicity.* Bhatnagar, R. S., ed. (Ann Arbor Sci. Publ. Inc.: Ann Arbor, MI): CH10: 229-272; 1980 (153 references).

Information on soluble epoxide hydrase is reviewed in relation to knowledge of microsomal epoxide hydrase. Primary sources and reviews concerned with work on epoxide hydration occurring in the microsomal fraction are noted. Much of the work on soluble mammalian epoxide hydrases arose out of the discovery that the diol of an epoxide containing juvenoid R 20458 was found to be an important *in vivo* and *in vitro* mammalian metabolite. An enzyme in the 100,000 *g* soluble fraction was found to be a

major contributor to this hydration. The procedures used to measure soluble epoxide hydrase activity have varied with the substrate used. The most sensitive procedures have involved the use of a radiolabeled substrate and chromatography. The distribution of epoxide hydrase activity is discussed in relation to species distribution, distribution with strain, age and sex, organ distribution, and subcellular distribution. Also discussed are substrate selectivity, the mechanism of epoxide hydration, the inhibition, stimulation and induction of soluble epoxide hydrase, environmental implications of soluble epoxide hydrase, and possible future work involving soluble epoxide hydrase.

81-2329. Thorgeirsson, S. S.; Schut, H. A. J.; Wirth, P. J.; Dybing, E. (NCI, NIH, Bethesda, MD 20014) **Mutagenicity and carcinogenicity of aromatic amines.** In: *Molecular Basis of Environmental Toxicity*. Bhatnagar, R. S., ed. (Ann Arbor Sci. Publ. Inc.: Ann Arbor, MI): CH11: 275-292; 1980 (40 references).

The mutagenicity of the aromatic amines 2-acetylaminofluorene (AAF) and its metabolite N-OH-AAF were investigated. Mutagenic activation of N-OH-AAF was observed with both mouse and rat liver cell nuclei. The effect of paraoxon on mutagenic activation by rat and mouse liver cell nuclei was determined. Control plates contained 2000 and 400 revertants/plate at 10 μg N-OH-AAF/plate, for mouse and rat liver respectively. On similar plates treated with 10^{-5} *M* paraoxon, mutagenic activation of N-OH-AAF was completely blocked. No paraoxon inhibition of mutagenicity was observed when rat liver cell nuclei, 100,000 *g* supernatant fraction of rat liver, and 10^{-5} *M* paraoxon were combined. It was concluded that mutagenic activation of N-OH-AAF by the nuclei-supernatant combination is catalyzed primarily by N,O-acyltransferase.

81-2330. Radding, S. B.; Furst, A. (SRI International, Menlo Park, CA 94025) **A review of metals and carcinogenicity.** In: *Molecular Basis of Environmental Toxicity*. Bhatnagar, R. S., ed. (Ann Arbor Sci. Publ. Inc.: Ann Arbor, MI): CH14: 359-372; 1980 (124 references).

Information on the carcinogenicity of metals and metal compounds is reviewed. Epidemiologic studies conducted through the use of past company records are considered. Results of animal tests, and tests on the interaction of metals with various tissues, are presented. Lead acetate and lead chromate have been found to be potent carcinogens in mice and rats. Possible synergistic effects between lead and arsenic or a nitrosamine compound were suggested from carcinogenicity studies with lead arsenate and sodium arsenate. The use of a carcinogenicity index is also considered.

81-2331. Schnell, R. C. (Dep. Pharmacol. & Toxicol., Sch. Pharm. & Pharm. Sci., Purdue Univ., West Lafayette, IN 47907) **Cadmium-induced inhibition of hepatic xenobiotic biotransformation.** In: *Molecular Basis of Environmental Toxicity*. Bhatnagar, R. S., ed. (Ann Arbor Sci. Publ. Inc.: Ann Arbor, MI): CH17: 403-417; 1980 (39 references).

Studies of the hepatotoxic effects of cadmium, particularly inhibition of the mixed function oxidase enzyme system localized in the endoplasmic reticulum, are reviewed. Specific topics covered include cadmium-induced alterations of drug responses, the mechanism of cadmium-induced inhibition of hepatic microsomal drug biotransformation, factors which influence cadmium inhibition of microsomal xenobiotic biotransformation, and sex-related differences in cadmium inhibition of drug biotransformation.

81-2332. Bhatnagar, R. S.; Hussain, M. Z.; Lee, S. D. (Lab. Connective Tissue Biochem., Sch. Dent., Univ. California, San Francisco, CA 94143) **The role of collagen as a primary molecular site of environmental injury.** In: *Molecular Basis of Environmental Toxicity*. Bhatnagar, R. S., ed. (Ann Arbor Sci. Publ. Inc.: Ann Arbor, MI): CH24: 531-558; 1980 (123 references).

The diversity, structure and synthesis of collagen are described. Its role in cell function and molecular aspects of collagen interactions are considered. Interference with collagen synthesis as a molecular mechanism of environmental toxicity is discussed. In the lungs collagen is a highly susceptible site for interaction with environmental toxins. The interactions of superoxide and lung collagen synthesis are considered. Neonatal rat lung explants, maintained in organ culture in the presence of paraquat, synthesized collagen at significantly elevated rates in comparison to controls. Addition of superoxide dismutase abolished an increase in collagen synthesis, confirming the involvement of superoxide.

81-2333. Witschi, H.; Haschek, W. M. (Biol. Div., Oak Ridge Natl. Lab., Oak Ridge, TN 37830) **Some problems in correlating molecular mechanisms and cell damage.** In: *Molecular Basis of Environmental Toxicity*. Bhatnagar, R. S., ed. (Ann Arbor Sci. Publ. Inc.: Ann Arbor, MI): CH25: 561-582; 1980 (38 references).

Difficulties in correlating molecular mechanisms of toxicity, determined by detailed biochemical studies, with the actual cell damage produced, are considered. The pulmonary toxicity of paraquat and diquat is discussed. Paraquat causes NADPH levels in type II alveolar cells to drop to lethal levels. Diquat produces general, transitory, nonfatal NADPH oxidation. It is suggested that this difference explains the differences between necrosis of granular pneumonocytes caused by paraquat and diquat.

81-2334. Douglas, G. R.; Nestmann, E. R.; Grant, C. E.; Bell, R. D. L.; Wytsma, J. M.; Kowbel, D. J.

(Mutagenesis Sect., Environ. & Occupat. Toxicol. Div., Dep. Natl. Health & Welfare, Ottawa, Ontario K1A OL2, Canada) **Mutagenic activity of diallate and triallate determined by a battery of *in vitro* mammalian and microbial tests.** *Mutat. Res.* 85(2): 45-56; 1981 (20 references).

Diallate and triallate are carbamate herbicides used mainly for the pre-emergence control of wild oats in various crops. The genetic activity of these compounds was studied using a battery of microbial and mammalian *in vitro* tests. In the *Salmonella*/mammalian- microsome assay, diallate and triallate show dose-related increases without metabolic activation in strains TA1535, TA100, and TA98, indicating that these compounds cause both frameshift and base-substitution mutations. Mutagenicity of both herbicides was enhanced greatly by incubation with Aroclor 1254 induced rat-liver S9. Genetic activity in mammalian cells was determined using a number of *in vitro* tests with Chinese hamster ovary (CHO) cells combined with metabolic activation as described above. Both diallate and triallate caused dose-related decreases in colony-forming ability, with concomitant dose-related increases in the frequencies of cells with chromosome damage and in the number of sister-chromatid exchanges. However, only diallate caused a reduction in DNA molecular wt as determined by alkaline sucrose gradient (ASG) sedimentation. DNA damage was negligible even at concentrations of triallate that reduced colony-forming ability to zero. This suggests that the lesions in DNA detected by the ASG technique are not necessarily related to those that produce chromosomal damage. These data, taken together, strongly implicate both diallate and triallate as capable of causing mutations in mammals. However the risk to man in terms of inherited disease or cancer remains to be established by appropriate *in vivo* methodology. (Author abstract by permission)

81-2335. Zdzienicka, M.; Zielenska, M.; Trojanowska, M.; Szymczyk, T.; Bignami, M.; Carere, A. (Dep. Biochem., Warsaw Med. Sch., PL-02097 Warsaw, Poland) **Microbial short-term assays with thiram *in vitro*.** *Mutat. Res.* 89(1): 1-7; 1981 (14 references).

The fungicide thiram was assayed in the following test *in vitro*, with and without metabolic activation: prophage λ induction in *Escherichia coli* K12; repair test in *Salmonella typhimurium* (strains TA1538 and TA1978); induction of gene mutations in *Aspergillus nidulans* (*methA1* suppressor induction). Thiram was positive in the repair test and in the *A. nidulans* forward-mutation test (4-6-fold increase) in the absence of metabolic activation. A slight increase was observed in prophage λ induction with thiram in the presence of the metabolic activation system. (Author abstract by permission)

81-2336. Plass, R.; Lewerenz, H. J. (Zentralinst. Ernaehrung, DDR-1505 Bergholz-Rehbruecke, DDR) **Bedeutung und Stellung der Enzymdiagnostik im Rahmen toxikologischer Untersuchungen von Pflanzenschutz- und Schadlingsbekampfungsmitteln und Mitteln zur biologischen Prozesssteuerung. [The significance and importance of enzymodiagnosis in the framework of toxicological studies of plant protectives, pesticides and agents for the biological control process.]** *Nahrung* 25(1): 71-81; 1981 (13 references) (German).

Studies on enzymodiagnosis of poisoning with plant protectives, pesticides and growth regulators are reviewed. Clinical chemical and biochemical data, including results of enzymodiagnosis obtained for blood serum, plasma and urine, are used increasingly in toxicological studies. Changes in the enzyme activities are indicators of a direct effect on the enzyme, of metabolic changes, and of lesions of certain organs. The studies of enzyme activities in the serum and urine are of great value in the detection of lesions of the liver and kidneys. Pesticide concentrations causing 40-60% inhibition of erythrocyte cholinesterase activity in experimental animals *in vitro* were found to be 3 mg/kg for parathion, 40 mg/kg for Delnav (dioxathion) and 50 mg/kg for ronnel and malathion. The corresponding concentrations causing 40-60% inhibition of hepatic carboxylesterase were 5 mg/kg for parathion, 10 mg/kg for Delnav, 30 mg/kg for ronnel, and 100 mg/kg for malathion. The corresponding values for plasma carboxylesterase were 5 mg/kg for parathion, 20 mg/kg for Delnav, 30 mg/kg for ronnel, and 500 mg/kg for malathion.

81-2337. LaBella, F. (Dep. Pharmacol. & Therapeut., Fac. Med., Univ. Manitoba, Winnipeg, Manitoba R3E 0W3, Canada) **Organochlorine insecticides and general anesthetics: a comparison of their neural effects.** *Perspect. Biol. Med.* 24(3): 447-456; 1981 (37 references).

A review is presented which supports the proposal that the relationship between neuroexcitant organochlorinated insecticides (DDT, aldrin, dieldrin, chlordane, and heptachlor) and their depressant analogs is similar to that between the convulsant analogs of general anesthetics and general (depressant) anesthetics. Several studies were conducted which demonstrate the proposed correlations. The potencies of neural action of DDT and anesthetic drugs are both related to lipid solubilities and dose. Evidence with regard to perturbation of ligand binding in brain tissues and factors that determine biological activity (lipophilicity and chemical structure) have been documented. Whereas chlorinated hydrocarbons were selected for their insecticidal property (resulting from neurotoxic action), general anesthetics (another group of neuroactive agents) were chosen for clinical application because they induce a state of insensibility and immobility.

81-2338. Antunes-Madeira, M. C.; Carvalho, A. P.; Madeira, V. M. C. (Cent. Biol. Cellular, Univ. Coimbra,

P-3049 Coimbra, Portugal) **Interactions of insecticides with erythrocyte membranes.** *Pestic. Biochem. Physiol.* 15(1): 79-89; 1981 (38 references).

Fresh heparinized blood samples were collected from adult pigs and washed with Tris buffered NaCl. Insecticides exerted anti-lytic effects on pig erythrocytes by preventing osmotic disruption of membranes in critical hypotonic saline media. The activity of the insecticides decreased in the order lindane > aldrin = azinphos > parathion = DDT > malathion. In solutions containing < 0.6 *M* glycerol erythrocytes swelled and hemolyzed. At higher concentrations and at temperatures below 20°C, the extent of cell lysis was very limited, and at 1 *M* glycerol it was virtually none. Cells swelled in hypertonic glycerol solutions until the initial equilibrium volume was reached. At that point the swelling process stopped. Swelling in 1 *M* glycerol was related to its permeation through hydrophobic membranes. Activation energies of permeation were similar to the dehydration energies of glycerol molecules. At temperatures above 20°C erythrocytes underwent lysis. Parathion and azinphos significantly increased the swelling rates and the extent of cell lysis. Malathion and chlorinated insecticides did not exert apparent effects. However, these compounds were effective in liposomes reconstituted with lipids extracted from erythrocyte membranes.

81-2339. Das, N.; Garg, A. (Ind. Toxicol. Res. Cent., Lucknow 226001, India) **Effect of endosulfan in female rats growing on low- and high-protein cereal diet.** *Pestic. Biochem. Physiol.* 15(1): 90-98; 1981 (34 references).

Female albino rats were given daily oral doses of 0.5 and 100 ppm endosulfan mixed in the diet. Rats were fed for 9 and 18 wk on poor rice diets (5% protein) or for 18 wk on a high-protein diet (24% protein). Body wt gain of rats receiving low protein diet was less than those raised on high-protein diet. Weight gains in rats belonging to control and the 0.5 and 100 ppm endosulfan, low protein diet groups were about 31, 63, and 62% less than in rats of the respective groups on the high protein diet. About 30 and 40% reductions in body wt gain were noted in rats in the 0.5 and 100 ppm endosulfan, basal rice diet groups. No mortality due to endosulfan occurred in the high protein group. After 9 wk, 50% of the 0.5 and 100 ppm endosulfan, low protein diet rats had died. Toxic symptoms in low-protein rats included growth retardation, low blood counts, low RNA and protein levels in the liver, and high glutathione levels in liver and blood. No changes in the activities of liver RHase, blood glucose-6-phosphate dehydrogenase, and glutathione reductase were noted. Liver glucose-6-phosphatase activity significantly increased. In both low and high protein diet groups, endosulfan caused accumulation of perirenal adipose tissue. Adipose tissue was found to contain α-endosulfan, β-endosulfan, and endosulfan sulfate; tissue samples from low-protein rats contained higher concentrations of these metabolites.

81-2340. Sharma, H. C.; Agarwal, R. A. (Entomol. Dep. IARI, New Delhi 110012, India) **Environmental pollution due to pesticides industry and methods to reduce it in India. I.** *Pesticides* 14(10): 3-5, 28; 1980 (17 references).

The risk of environmental pollution from the pesticide industry is related to the large number of toxic compounds involved and the high levels of production. Pesticide consumption in India is estimated to be 170 g/ha, compared to 11,800 g/ha in Japan and 3000 g/ha in West Germany and the United States. Occupational health hazards exist in the pesticide industry. Few accidents have been reported among workers in pesticides manufacture. However, formulating plants present greater risks to human health. Chronic effects of pesticides are reviewed, including mutagenesis, teratogenesis, carcinogenesis and cataractogenesis. Other effects of chlorinated hydrocarbons, organophosphates, carbamates, herbicides and fungicides are also considered.

81-2341. Beretta, C.; Fadini, L.; Montesissa, C.; Pompa, G.; Stoppani, E. (Inst. Vet. Pharmacol. & Toxicol., Univ. Milan, Milan, Italy) **Membrane lipid composition of subcellular fractions from lungs of rats treated with paraquat.** *Pharmacol. Res. Commun.* 13(5): 433-442; 1981 (22 references).

Albino Wistar rats were used in studies designed to determine changes in lung membrane lipid composition due to paraquat treatment. Animals were dosed orally with 125 mg paraquat/kg, then sacrificed at 48, 96 and 192 hr after treatment. Body wt was determined, and ceruloplasmin levels were analyzed in the plasma as an indicator of stress. Lung tissue was weighed, than extracts were analyzed for cholesterol and fatty acids. Body wt decreased and ceruloplasmin plasma levels increased, while lung wt was not affected. An early and transient increase in cholesterol occurred in mitochondrial membranes, and late reduction of palmitic, stearic, oleic and linoleic acids occurred in cell debris, nuclei and microsomal membranes. It is suggested that paraquat causes a weakening of the lipid structure of the membranes of these subcellular components.

81-2342. Bradt, P. T.; Williams, J. A. (Dep. Biol., Layayette Coll., Easton, PA 18042) **The effect of carbaryl on the stream insect family Hydropsychidae (Trichoptera).** *Proc. Penn. Acad. Sci.* 54(2): 133-135; 1980 (17 references).

Larvae of the family Hydropsychidae were collected from rocks in the Bushkill Creek, Northampton County, PA, during the summer of 1979. Hydropsychidae comprised 38.6% of the benthic macroinvertebrate population of that creek. Carbaryl was mixed with creek water to give 0.22, 0.54, and 0.86 ppm concentrations. At 16 hr after exposure, none of the larvae survived. Mortality rates increased with increased concentrations. Thousands of

acres of forest have been sprayed with carbaryl in the northeast in efforts to control the gypsy moth. A maximum concentration of 0.26 ppm carbaryl was reported in water 2.8 hr after aerial spraying at 1 lb/acre (2.2 kg/ha). Caution should be used to avoid contamination of flowing waters and resulting drastic reductions in important aquatic organisms.

81-2343. Mulla, M. S.; Mian, L. S. (Dep. Entomol., Univ. California, Riverside, CA 92521) **Biological and environmental impacts of the insecticides malathion and parathion on nontarget biota in aquatic ecosystems.** *Residue Rev.* 78: 101-135; 1981 (118 references).

In this review most of the available information on the impact of malathion and parathion on non-target flora and fauna in aquatic ecosystems and their persistence and distribution in aquatic habitats is collected and interpreted. The entry of these insecticides into the aquatic systems is mainly through direct applications to control pest and vector insects, or through indirect sources resulting from treatments against insect pests in agro- or silva-ecosystems. Both insecticides have shown some persistence in the water habitat. Of the 2 insecticides, malathion is rapidly metabolized by certain algae. Parathion, on the contrary, is inhibitory to the growth and photosynthesis of some green algae and is not readily metabolized, but it is rather concentrated in these plants. Multifold accumulation of parathion also occurs in certain flagellates and some ciliate species. The latter also has been found to be inhibitory to the growth and survival of certain zooplankton. Both malathion and parathion have shown a low level of toxicity to a number of molluscs. The former compound has been found to be innocuous to some annelids. Among the crustaceans waterfleas, amphipods, shrimp and juvenile crabs are sensitive to malathion. Parathion also possesses a high level of toxicity to shrimp. Immature non-target insects show high sensitivity to these insecticides. These compounds have exhibited differential toxicity to various fish species. Certain species have shown some degree of tolerance to malathion. Malathion is considered to have little or no toxicity at practical dosages to birds. Parathion, in contrast, is toxic to birds; its LD50 for mallards, pigeons, sparrows, quails, and pheasants falls below 25 mg/kg. Parathion, at practical application rates, is considered to have little or no significant toxicity to several amphibians in aquatic habitats or to a number of rodent species in agro-ecosystems. (Author abstract by permission, abridged)

81-2344. Colosi-Esca, D.; Barbarino, F.; Anca, Z.; Zugravu, E.; Ciugudeanu, M.; Gabor, S.; Papilian, V. V. (Inst. Hyg. Public Health, Cluj-Napoca, Romania) **Cercetari toxicologice asupra unui insecticid organofosforic. [Toxicological studies on an organophosphorus insecticide.]** *Rev. Chim. (Bucharest)* 31(12): 1145-1149; 1980 (8 references) (Rumanian).

The toxicity of an organophosphorus pesticide was studied in Wistar rats. The compound was a mixture of the thiono and thiolo phosphoric acid esters of a compound similar to methyldemeton. The oral LD50 was determined to be 53 mg/kg. Oral treatment with 1 and 5% daily doses for 3-6 mo produced no toxic effects. The toxicity of the preparation and its effects on enzymes (GOT, GPT, TGO, TGP, butylcholinesterase, lactate dehydrogenase, and alkaline phosphatase) were found to be similar to those of other organophosphorus pesticides.

81-2345. Borkowska, J.; Tyburczyk, W. (Dep. Basic Anal., Inst. Med. Pract. & Hyg., Lublin, Poland) **Dzialanie monokrotofosu na uklad neuroprzenosnikow osrodkowego ukladu merwowego. [Monocrotophos action on the neurotransmitter system in the central nervous system.]** *Rocz. Panstw. Zakl. Hig.* 31(6): 605-610; 1980 (14 references) (Polish).

White rats were used in studies designed to determine the effect of monocrotophos on the metabolism of catecholamines and serotonin, on the process of glutamic acid decarboxylation, and on cholinesterase activity in the brain. Single doses of 0.1, 0.05 and 0.025 of the LD50 were given, and the animals observed for 24 hr. Another group of rats received 0.05 of the LD50 daily for 30 days. Single doses of 0.1 and 0.05 of the LD50 as well as daily dosing with 0.05 LD50 resulted in reduced cholinesterase activity in whole blood and in the brain. Monocrotophos had no effect on the process of glutamic acid decarboxylation or on the levels of serotonin or 5-hydroxyindoleacetic acid. Increases were seen in the levels of the serotonin precursors, free trytophan and 5-hydroxytryptophan. It is concluded that the toxic action of monocrotophos depends mainly on inhibition of cholinesterase activity.

81-2346. Babich, H.; Davis, D. L. (Toxic Subst. Program, Environ. Law Inst., Washington, DC 20036) **Dibromochloropropane (DBCP): A review.** *Sci. Total Environ.* 17(3): 207-221; 1981 (39 references).

Dibromochloropropane has been used in agriculture as a nematocide since 1955, being available in the US as technical grade containing not less than 95% DBCP, as emulsifiable concentrates and as solutions or granules and in fertilizer mixtures. DBCP may be applied to soil as injection, pressure or gravity flow irrigation, sprinkler irrigation, drench application and granular deposition. DBCP volatilizes once in the soil and has a fumigating action. Recent studies have shown DBCP to be a carcinogen and a mutagen and to affect adversely the reproductive system of male human beings. Regulatory agencies began action in 1977 after the sterility caused by this compound was made known. In 1979 the EPA banned almost all agricultural uses of DBCP.

81-2347. Anderson, J. P. E.; Armstrong, R. A.; Smith, S. N. (Sparte Pflanzenschutz, Anwendungstech. CE

Oekolbiol., Bayer AG, D-5090 Leverkusen, BRD) **Methods to evaluate pesticide damage to the biomass of the soil microflora.** *Soil Biol. Biochem.* 13(2): 149-153; 1981 (16 references).

Samples of parabrown soil were collected from the surface 10 cm of a wheat field, bulked, and then sieved. Water content of the soil was determined and the soil was stored at 2°C. The soil was mixed with enough fungicide to give final concentrations of 5 and 50 μg AI/g soil. The fungicides used were captan, thiram, and Verdasan (a mercurial). All three compounds significantly reduced the biomass immediately after application. Captan at both concentrations reduced the biomass by > 50%. Captan at 5 μg/g allowed complete recovery within 8 days and captan at 50 μg/g caused a much more gradual recovery. Thiram did not depress the microbial biomass to the same extent as captan and biomass recovery was also much quicker. The influence of Verdasan was markedly different. In soil treated with 5 μg/g, the microbial biomass was reduced by > 50% and recovered during the 64 days of the study only to a very slight degree. At 50 μg/g Verdasan initially caused a significant biomass reduction but recovery was noted after 4 days and went on to surpass biomass levels in control samples.

81-2348. Beck, S. L. (Biol. Dep., Wheaton Coll., Norton, MA 02766) **Assessment of adult skeletons to detect prenatal exposure to 2,4,5-T or trifluralin in mice.** *Teratology* 23(1): 33-55; 1981 (67 references).

A group of 88 spontaneously occurring variations of the skeleton were studied in adult CD-1 mice which been exposed *in utero* to the herbicides 2,4,5-T or trifluralin, administered to their dams by gavage, in an attempt to detect subtle biological effects of these compounds even in the absence of gross malformations. Sixty-seven characters showed variation in this population. Of these, 19 were significantly different in frequency from untreated controls in mice having received a teratogenic dose of 2,4,5-T, with an average difference of 23.7%. Seventeen of them were increased in frequency. By contrast, only three traits differed from untreated among mice receiving a no-effect dose of 2,4,5-T. Twelve traits differed significantly from untreated in the trifluralin-treated group; the average difference was 18.8%, with 10 of the traits being increased in frequency. The skeletal variant assay system may be useful as a postnatal screen for detecting prenatal exposure to potentially noxious substances. (Author abstract by permission, abridged)

81-2349. Beaudoin, A. R.; Fisher, D. L. (Dep. Anat., Univ. Michigan, Ann Arbor, MI 48109) **An *in vivo/in vitro* evaluation of teratogenic action.** *Teratology* 23(1): 57-61; 1981 (15 references).

Several compounds were administered to pregnant Wistar-derived rats either 24 or 4 hr prior to the recovery of day 10 embryos for *in vitro* culture in Waymouth's medium and fetal calf serum. The compounds tested were 2-amino-1,3,4-thiadiazole (thiadiazole), cadmium sulfate, 1,2-dibromo-2,2- dichloroethyl dimethyl phosphate (Dibrom; naled), 2-(*sec-butyl*)- 4,6-dinitrophenol (dinoseb), lead nitrate, polybrominated biphenyls (PBB), sodium arsenate, and trypan blue. After 24 hr in culture, two thirds of the embryos were recovered for examination. The remaining one third were continued in culture until 42 hr. Recovered embryos were examined for rotation of the embryonic axis, heart rate, establishment of the visceral yolk sac circulation, somite number, growth of the limb buds, closure of the neural tube, and development of the allantois and amnion. All tested compounds inhibited the rate of development *in vitro*. (Author abstract by permission)

81-2350. Mount, M. E.; Dayton, A. D.; Oehme, F. W. (Comp. Toxicol. Lab., Kansas State Univ., Manhattan, KS 66506) **Carbaryl residues in tissues and cholinesterase activities in brain and blood of rats receiving carbaryl.** *Toxicol. Appl. Pharmacol.* 58(2): 282-296; 1981 (39 references).

The diagnostic value of measuring insecticide levels and cholinesterase activity in carbaryl-poisoned rats was studied. Mature, male rats received 450, 800, or 1200 mg carbaryl/kg orally, and carbaryl residues in liver, heart, and brain and/or cholinesterase (ChE) activity in brain, red blood cells, and plasma of sacrificed, moribund, and dead rats were compared. Significant tissue residues were still present 24-48 hr after dosing. The lowest liver, heart, and brain carbaryl levels were 11.7, 3.6, and 5 ppm, respectively, in fatally poisoned rats. The brain ChE activity of fatally poisoned rats was less than 35% of normal, while surviving rats had greater than 55% of normal ChE activity 48 hr after dosing. Following dosing, red blood cells and plasma ChE activity was near 30% of normal. Cholinesterase activity in brain, red blood cells, and plasma was back to 70% of normal 96 hr after dosing. Blood studies on gastrointestinal tract absorption of carbaryl indicated that prolonged absorption may account for extended clinical signs observed. Whole blood was superior to plasma for carbaryl determination. (Author abstract by permission)

81-2351. Carricaburu, P.; Lacroix, R.; Lacroix, J. (Lab. Biophys., Fac. Med., Abidjan, Ivory Coast) **Electroretinographic study of the white mouse intoxicated by organo-phosphorus: mevinphos and malathion.** *Toxicol. Eur. Res.* 3(2): 87-89, 91; 1981 (14 references).

ERG's were obtained from undamaged white, Swiss, NMRI, male and female mice. After obtaining the ERG, the mice were injected with mevinphos (0.015 mg) or malathion (300 mg), previously dissolved in dimethylacetamide. Modifications caused by the insecticides in the ERG included a flattening and lengthening of the a-wave and collapse and stretching of the b-wave. With regard to

amplitudes and time-lags, the a-wave demonstrated slight decreases of amplitudes, simultaneously, and more important, with an increase of time-lags. The b-wave amplitudes were regularly decreased in a more marked manner than the a-wave and the time-lags increased during the first 10 to 20 min of the experiment and then became steady. The modification of a-wave parameters revealed a slightly decreased excitability of the photoreceptors. Photoreceptor repolarization was strongly perturbed. Modifications of b-wave revealed perturbation of the excitation of the bipolar neurones, which was a consequence of the action at the level of the synapses, not excluding direct damage of the very bipolar cells.

81-2352. Verma, S. R.; Rani, S.; Dalela, R. C. (Pollut. Relevant Res. Lab., Postgrad. Dep. Zool., D.A.V. Coll., Muzaffarnagar 251001, India) **Isolated and combined effects of pesticides on serum transaminases in *Mystus vittatus* (African catfish).** *Toxicol. Lett.* 8(1-2): 67-71; 1981 (12 references).

Healthy specimens of *Mystus vittatus* were collected from Kalinadi of the Muzaffarnagar district in India, and exposed to sublethal concentrations of Thiotox (thiram), dichlorvos, carbofuran, or their combinations, to examine the effects of the pesticides on serum transaminases. In general SGOT was more sensitive than SGPT. Maximum elevations of 92.51% were noted in SGOT at highest concentrations of Thiotox + dichlorvos or carbofuran combinations. Minimum elevations of 14.76% were obtained at the lowest concentration of Thiotox + dichlorvos combinations. Elevated levels of SGOT and SGPT were found in increasing order from Thiotox + dichlorovs, to dichlorovs, to carbofuran + thiotox combinations, to carbofuran, and to Thiotox. Highest elevations occurred with dichlorvos + carbofuran.

81-2353. Iwama, G. K.; Greer, G. L. (Fish & Wildl. Branch, Minist. Environ., Victoria, British Columbia V8N 2Y9, Canada) **Effect of a bacterial infection on the toxicity of sodium pentachlorophenate to juvenile coho salmon.** *Trans. Am. Fish. Soc.* 109(3): 290-292; 1981 (10 references).

Young Capilano River coho salmon (125 in each group) were acclimatized for 14 days to 2 troughs supplied with aerated well water. One adult sockeye salmon, from a known infected stock with overt physical signs of bacterial kidney disease and weighing about the same as the total weight of the juvenile coho, was placed in the upstream half of one trough and 154 fish of the same stock were placed in the upstream half of the other trough as disease controls. After 28 days fish were removed from the downstream halves of the troughs and subjected to flow-through toxicity tests with Na-PCP. At the end of the 28-day exposure of coho salmon to the infected sockeye salmon, kidney smears from coho salmon showed small numbers of short, gram-positive diplobacilli typical of bacterial kidney disease pathogen; no bacilli occurred in disease control smears. It was concluded that the low-level bacterial infection in asymptomatic coho salmon resulted in their greater sensitivity to the toxic action of Na-PCP.

81-2354. Sanders, H. O.; Walsh, D. F.; Campbell, R. S. (Columbia Natl. Fish. Res. Lab., US Fish & Wildl. Serv., Columbia, MO 65201) **Abate: effects of the organophosphate insecticide on bluegills and invertebrates in ponds.** *US Fish Wildl. Serv. Tech. Pap.* 104: 6 pp.; 1981 (11 references).

Abate (temephos) was applied 3 times at monthly intervals to duplicate 0.04 ha earthen ponds at the recommended application rate of 18 g/ha, and at 180 g/ha (40 µg/l). The ponds contained bluegills and invertebrates. No mortality among bluegills was noted. Treatment with 18 g/ha resulted in the production of fewer bluegill fry. No affects were noted on brain acetylcholinesterase activity. The fry and adults experienced accelerated growth probably from heavy feeding on dead or moribund Diptera larvae resulting from each of the first 2 applications of Abate. Treatment with 180 g/ha speeded ovary development in bluegills. The number of fry produced/female was lower than in control ponds. Brain AChE activity was strongly inhibited after the second and third treatments. Biomass of Diptera in the ponds was reduced about 40%, but other invertebrates were not affected. The routine use of Abate at the recommended rate should have little adverse effect on fishery resources.

81-2355. Bochkov, N. P. (Inst. Med. Genet., Moscow, USSR) **Geneticheskie posledstviya vozdeistviya faktorov okruzhauushchei sredy. [Genetic consequences of exposure to environmental agents.]** *Vestn. Akad. Med. Nauk SSSR* (3): 13-19; 1981 (18 references) (Russian).

Genetic consequences of exposure to environmental factors such as ionizing radiation, temperature, vibration, microwaves and chemicals are discussed. Mutagenic activity was recorded for DDT, ziram, organophosphorus pesticides, carbamates, and polychlorocamphenes (toxaphene). Constant contamination of the environment by new chemicals dictates the need of prognosis of the mutagenic activity of potential environmental pollutants.

81-2356. Sundlof, S. M.; Parker, A. J.; Simon, J.; Dorner, J. L.; Hansen, L. G. (Coll. Vet. Med., Univ. Illinois, Urbana, IL 61801) **Sub-acute toxicity of hexachlorobenzene in female beagles, including electroencephalographic changes.** *Vet. Hum. Toxicol.* 23(2): 92-96; 1981 (20 references).

The possibility of humans being poisoned by hexachlorobenzene (HCB) has been realized due to the use of

this chemical as a fungicide for wheat, and due to its presence as a contaminant in animal feeds and in food for humans. Toxic manifestations arise from HCB or metabolite interactions with porphyrin metabolism, hepatocytes, the CNS, the hematopoietic system, and the immunological system. Adult female beagles given oral HCB for 21 days exhibited accumulation of HCB in fat; these levels were higher in animals given subdivided doses. When a 10 day period of food restriction immediately after 21 days of dosing was enforced, residues increased but obscured any differences due to dosing regimen. Liver and hepatocyte enlargement as well as physiologic changes in the CNS were HCB-induced. Weight loss and various hematological changes were equivocal with dietary stress and HCB probably contributed to the changes to varying degrees. A dose of 50 mg/kg/day of HCB for 21 days was considered the least toxic to female beagles.

81-2357. Barton, K. J.; Oehme, F. W. (Comp. Toxicol. Lab., Kansas State Univ., Manhattan, KS) **The incidence and characteristics of animal poisonings seen at Kansas State University from 1975 to 1980.** *Vet. Hum. Toxicol.* 23(2): 101-102; 1981.

Animal poisonings reported to the Kansas State University Veterinary Hospital between 1975 and 1980 are tabulated by causative agent. Incidence relationships between species and mortality, season or sex and mortality, and age and mortality were examined. Organophosphate toxicosis was most frequently observed in cats. A total of 20 out of the 139 cases were due to organophosphorus compounds. Organochlorines, carbamates, other insecticides, warfarin, Vacor (pyriminil), other rodenticides, and herbicides accounted for 29 of the cases. A seasonal correlation between chlorinated hydrocarbon poisonings or organophosphate poisonings and use of these chemicals in the agricultural community was observed, with peaks occurring during the summer months.

81-2358. Slyn'ko, L. I. (State Res. Inst. Lake & River Fish., USSR) **Nakoplenie i deistvie 2M-4Kh na organizm zhivotnykh. [Accumulation and effect of 2M-4Kh on animals.]** *Veterinariya (Moscow)* (3): 60-61; 1981 (Russian).

Accumulation of the herbicide 2M-4Kh (Dikotex; MCPA) in food chains and its toxicity to trout and albino rats were studied. Accumulation of 2M-4Kh in trout was recorded at herbicide concentrations of 16 mg/l in bodies of water. Herbicide concentrations of 2 mg/l were safe for roe and fry. Histological changes in the digestive tract, liver, and kidneys of trout were recorded at herbicide concentrations of 1 mg/l. Changes included dystrophy of hepatocytes, desquamation of the intestinal epithelium and dystrophy of the epithelium of the convoluted tubules. Rats fed fish containing 2M-4Kh developed changes in the intestine, liver and kidney similar to those recorded in exposed fish.

81-2359. Layiwola, P. J.; Linnecar, D. F. C. (Bioorganic Res. Group, Polytech. Cent. London, London W1M 8JS, England) **The biotransformation of (^{14}C)phenol in some freshwater fish.** *Xenobiotica* 11(3): 167-171; 1981 (16 references).

The biotransformation of phenol was investigated in 8 species of freshwater fish: bream (*Abramis brama*), goldfish (*Carassius auratus*), guppy (*Poecilia reticulata*), minnow (*Phoximus phoximus*), perch (*Perca fluviatilis*), roach (*Rutilus rutilus*), rudd (*Scardinius erythropthalmus*) and tench (*Tinca tinca*), when exposed to sublethal concentrations of phenol in the aquarium water. The 2 conjugates, phenyl sulfate and phenyl glucuronide, were the sole detected products produced by bream, perch, roach and rudd while phenyl sulfate alone was produced by goldfish, guppy, minnow and tench. The immersion dosing method employed for the experiment is discussed with relation to the natural habitat of the fish. (Author abstract by permission)

81-2360. Bakke, J. E.; Aschbacher, P. W.; Feil, V. J. (Metab. & Radiat. Res. Lab., Agric. Res., USDA, Fargo, ND 58105) **The metabolism of pentachloromethylthiobenzene in germ-free and conventional rats.** *Xenobiotica* 11(3): 173-178; 1981 (20 references).

Rats treated with pentachloronitrobenzene (PCNB; quintozene) have been found to excrete pentachloromethylthiobenzene. Both germ-free and conventional rats excreted over 80% of oral doses of pentachloromethylthio[^{14}C]benzene in the feces. The feces from germfree rats contained mainly *N*-acetyl-*S*-(methylthiotetrachlorophenyl) cysteine. The feces from conventional rats contained bis-(methylthio) tetrachlorobenzene and non-extractable residues in about equal amounts. (Author abstract by permission, modified)

See also 81-2101, 81-2102, 81-2109, 81-2110, 81-2111, 81-2112, 81-2114, 81-2115, 81-2116, 81-2117, 81-2118, 81-2119, 81-2120, 81-2121, 81-2122, 81-2123, 81-2125, 81-2126, 81-2128, 81-2129, 81-2130, 81-2131, 81-2133, 81-2134, 81-2148, 81-2149, 81-2150, 81-2151, 81-2152, 81-2153, 81-2154, 81-2155, 81-2156, 81-2157, 81-2158, 81-2159, 81-2160, 81-2161, 81-2162, 81-2163, 81-2164, 81-2165, 81-2166, 81-2167, 81-2168, 81-2169, 81-2170, 81-2171, 81-2172, 81-2173, 81-2174, 81-2175, 81-2176, 81-2177, 81-2182, 81-2184, 81-2188, 81-2195, 81-2202, 81-2204, 81-2206, 81-2215, 81-2218, 81-2219, 81-2228, 81-2229, 81-2232, 81-2233, 81-2234 *and* 81-2235.

81-2361. Sherma, J.; Zweig, G. (Chem. Dep., Lafayette Coll., Easton, PA 18042) **Pesticides.** *Anal. Chem.* 53(5): 77R-88R; 1981 (396 references).

This review covers literature on pesticide analysis for the period September 1978 to September 1980. Several reviews are cited which cover not only with the general area of pesticide analysis but, more specifically, sampling and cleanup procedures and quality control. The application of gas chromatography in food analysis, particularly dealing with pesticide residues, has been improved and expanded. Similarly, work has continued in the areas of high-performance liquid chromatography, thin-layer chromatography and various other techniques, such as fourier-transform infrared spectrometry, nuclear double resonance spectrography, polarographic determinations, chemical derivatization techniques, carbon skeleton GC, and specific detection methods for *N*-nitroso compounds. General procedures are cited for chlorinated pesticides, organophosphorus pesticides, carbamates, herbicides, fungicides, and chlorinated compounds related to pesticides including PCBs, PCTs, PCNs, and TCDD.

81-2362. Grabinski, A. A. (Water Chem. Program, Univ. Wisconsin, Madison, WI 53706) **Determination of arsenic(III), arsenic(V), monomethylarsonate, and dimethylarsinate by ion-exchange chromatography with flameless atomic absorption spectrometric detection.** *Anal. Chem.* 53(7): 966-969; 1981 (21 references).

Aqueous arsenic(III), arsenic(V), monomethylarsonate (ammonium methanearsonate; MMA), and dimethylarsinate (DMA; DSMA) were separated with ion-exchange chromatography. The elution sequence was as follows: 0.006 *M* trichloroacetic acid (pH 2.5), yielding first As(III) and then MMA; 0.2 *M* trichloroacetic acid yielding As(V); 1.5 M NH_4OH followed by 0.2 *M* trichloroacetic acid yielding DMA. Detection was by flameless atomic absorption spectrometry. Arsenic recoveries (full procedure) ranged from 97% to 104% for typical lake water samples; more erratic but still acceptable recoveries (96% to 107%) were obtained from arsenic contaminated sediment interstitial water. The overall analytical detection limit was 10 ppb (original sample mixture) for each individual arsenic species. Relative standard deviations ranged from 0.7% to 1.3% for lake water and distilled deionized water replicates spiked at the 500 ppb level. (Author abstract by permission)

81-2363. Smrek, A. L.; Head, S. L.; Needham, L. L. (Toxicol. Branch, Clin. Chem. Div., Bur. Lab., Cent. Dis. Control, US Dep. Health & Hum. Serv., Atlanta, GA 30333) **Comparison of two deproteinization methods for the determination of DDT and DDT metabolites in serum.** *Anal. Lett.* 14(2): 81-96; 1981 (6 references).

Methanol deproteinization and formic acid deproteinization methods were used for quantitative ppm determinations of DDT and DDT metabolites. Sets of 10 samples of *in vitro* serum, fortified at the ppb level, were processed by each method. The absolute recoveries of both procedures were quite good. The methanol deproteinization procedure was significantly more effective in extracting *o,p'*-DDE, *p,p'*-DDD, and *o,p'*-DDT. No significant difference in the means for *p,p'*-DDT was found. The coefficients of variation were much less for the methanol deproteinization method. The methanol deproteinization method was more efficient in extracting DDT-type compounds than the formic acid method. The difference for the ΣDDT values for the 2 methods was 15%.

81-2364. Fairall, R. J.; Scudamore, K. A. (Slough Lab., Min. Agric. Fish. & Food, Slough, Berkshire SL3 7HJ, England) **Determination of residual methyl bromide in fumigated commodities using derivative gas-liquid chromatography.** *Analyst (London)* 105: 251-256; 1980 (6 references).

A sensitive method for the determination of residual methyl bromide in fumigated foodstuffs is described. Methyl bromide in extracts was converted stoichiometrically into methyl iodide by reaction with sodium iodide and analyzed using gas-liquid chromatography with electron-capture detection. Residual methyl bromide was readily detected at the 10 μg/kg level in a variety of foodstuffs. (Author abstract by permission)

81-2365. Caverly, D. J.; Unwin, J. (Agric. Dev. & Adv. Serv., Minist. Agric. Fish. & Food, Ashford, Kent TN25 5EL, England) **Determination of residues of furalaxyl and metalaxyl in nutrient solution, peat compost and soil samples by gas chromatography.** *Analyst (London)* 106(1261): 389-393; 1981 (2 references).

Rapid and sensitive techniques for the determination of residues of the fungicides furalaxyl and metalaxyl in agricultural samples are described. Air-dried soils and peat composts are extracted with acetone in a Soxhlet apparatus; the extract is applied directly to the gas chromatograph and detected using a nitrogen-selective detector. Plants are macerated with acetone and, after filtration and dilution with water, partitioned with chloroform; nutrient solutions are similarly extracted with chloroform. The extracts are subjected to gas chromatography after removal of chloroform and dissolution in acetone. Recoveries are generally better than 80% with detection limits of 0.5 mg/kg for peat, 0.1 mg/kg for soils and plants and 0.02 mg/kg for nutrient solutions. (Author abstract by permission)

81-2366. Cattabeni, F. (Ist. Farmacol. & Farm., Univ. Milano, I-20129 Milan, Italy) **Multiple selected ion monitoring in biochemistry, pharmacology and toxicology.** *Ann. Chim. (Rome)* 71(1-2): 77-88; 1981 (21 references).

The high versatility and usefulness of multiple selected ion monitoring (MSIM) is discussed, using as an example the environmental detection of TCDD after the industrial accident in Seveso, Italy, in July 1976. The chemico-physical properties of TCDD rendered this molecule well suited for this type of analysis. TCDD can be analyzed as it is, without derivatizing reactions, through the gas-chromatograph and the mass spectrum showing a very simple fragmentation pattern; the molecular ion cluster is most abundant in the EI-spectrum. Focusing the instrument at m/x 320, 322, and 324, together with its retention time, permits identification, with high specificity, of TCDD in environmental samples. Quantitation is obtained through an external standard. The extraction procedure involves shaking the sample with dichloromethane, filtering the organic solvent and concentrating the final product. An aliquot can then be directly injected into the gas chromatograph-mass spectrometer.

81-2367. Bradway, D. E.; Noseman, R.; May, R. (Anal. Chem. Branch, Environ. Toxicol. Div., Health Effects Res. Lab., US EPA, Research Triangle Park, NC 27711) **Analysis of alkyl phosphates by extractive alkylation.** *Bull. Environ. Contam. Toxicol.* 26(4): 520-523; 1981 (9 references).

The extraction of the alkyl phosphate from urine as an ion-pair with a lipophilic quaternary ammonium cation may be a promising technique for analysis of alkyl phosphate metabolites of organophosphorus pesticides. The ion pair in this study was extracted into dichloromethane, which contains the alkylating agent pentafluorobenzyl bromide. As the non-polar solvent possesses poor solvating ability, it renders the alkyl phosphate highly reactive toward nucleophilic displacement. The resulting pentafluorobenzyl ester derivative is thermally stable and highly responsive under conditions of gas chromatographic analysis using a flame photometric detector or nitrogen-phosphorus detector. Each of the 6 following alkyl phosphates was analyzed by this method: *O,O'*-dimethyl phosphate (DMP), *O,O'*-diethyl phosphate (DEP), *O,O'*-dimethyl phosphorothioate (DMTP), *O,O'*-diethyl phosphorothioate (DETP), *O,O'*-dimethyl phosphorodithioate (DMDTP), and *O,O'*-diethyl phosphorodithioate (DEDTP). DMTP, DETP, DMDTP, and DEDTP were adequately extracted from water as the ion pair with tetrabutylammonium hydrogen sulfate. The extraction of DEP and DMP was incomplete. Using tetrahexylammonium hydrogen sulfate as the counter ion, DEP was also extracted and derivatized, although recovery of DMP was still very low.

81-2368. Oxinos, K.; Parlar, H.; Korte, F. (Inst. Oekol. Chem., Ges. Strahlen & Umweltforsch. Muenchen, D-8050 Freising-Attaching, BRD) **Massenspektrometrisches Verhalten der 4,5,6,7,8,8-hexachlor- (2,3) 3a,4,7,7a-tetrahydro(hexahydro) -4,7-methano-1H- indene. [Mass spectrometric behavior of 4,5,6,7,8,8-hexachloro- (2,3) 3a,4,7,7a-tetrahydro(hexahydro) -4,7-methano-1H- indenes.]** *Chemosphere* 10(1): 63-66; 1981 (7 references) (German).

The mass spectrometric characterization and some environmental aspects of 4,5,6,7,8,8-hexachloro-(2,3)3a,4,7,7a-tetrahydro(hexahydro) 4,7-methano-1*H*-indene (HTHMI) insecticides are described. Due to their undesirable side-effects and persistence in the environment, HTHMI preparations have been replaced recently by other preparations. HTHMI's occur ubiquitously in the environment and accumulate in the food chain. The retro-Diels-Alder fragmentations of these substances are often sufficient for their characterization. Differentiation between the chloromethanoindenes and other cyclodiene insecticides is possible on the basis of these fragments.

81-2369. Stijve, T. (Control Lab., Nestle Prod. Tech. Assist. Co. Ltd., La Tour de Peilz, Switzerland) **Gas chromatographic determination of inorganic bromide residues – a simplified procedure.** *Dtsch. Lebensm. Rundsch.* 77(3): 99-101; 1981 (9 references).

A method is reviewed which can be used to determine inorganic bromide residues in soils or fumigated products based on the conversion of bromide ion to 2-bromoethanol by reaction with ethylene oxide. It was determined that the method could be improved by using a different method of dispensing the reagent to the test portion and by shortening the reaction time and changing extraction conditions. The procedure, as revised, could then be miniaturized and enable the analyst to perform bromide determinations on as little as 100 mg of material.

81-2370. Ha, V. Y. D.; Berner, K. G. (Inst. Lebensmittelchem., Univ. Stuttgart, D-7000 Stuttgart 80, BRD) **Dunnschichtchromatographische Untersuchung von Phenylharnstoff- und N-phenylcarbamat- Rueckstanden. II. Quantitative Bestimmung in Mohren, Kartoffeln und Wein. [Thin-layer chromatography determinations of phenylurea- and *N*-phenylcarbamate-herbicide residues. II. Quantitative analysis in carrots, potatoes and wine.]** *Dtsch. Lebensm. Rundsch.* 77(3): 102-106; 1981 (7 references) (German).

The thin-layer chromatographic quantitative determination of phenylurea and N-phenylcarbamate residues in carrots, potatoes and wine is described. The specific substances determined were diuron, linuron, monolinuron, methobromuron, chlorotoluron, propham, chlorpropham, Swep and phenmedipham. The determination of these substances is based on hydrolysis with methanolic KOH to anilines. After extraction with organic solvents, the extract is used directly for hydrolysis at the start point of the TLC plate, after which the plate is developed and then sprayed with fluorescamine solution (0.1 mg/ml acetone). The

fluorescing spots thus obtained are measured with a TLC spectrophotometer and evaluated by means of a calibration curve. The average recovery rates for 1 ppm of active substance were 72.9-89.9% in potatoes and carrots and 75.8-104% in wine. At 0.5 ppm, the recovery rates were 58.8-75.5% in potatoes and carrots, and 59.5-98.9% in wine. At 0.1 ppm, the recovery rates were 50-60% in most samples of carrots and potatoes, 87.5-94.5% for phenylurea derivatives and 40.3-53.5% for N-phenylcarbamates in wine. Only a few phenylurea derivatives failed to escape detection at 0.05 ppm.

81-2371. Srivastava, S. P.; Reena (Chem. Lab., Univ. Roorkee, Roorkee, India) **TLC separation of some typical organo-chlorine pesticides.** *Fresenius Z. Anal. Chem.* 306(1): 25; 1981 (2 references).

Various solvent systems were tested with plain silica gel to develop a suitable system for analyzing the class of pesticides which includes endosulfan B so that thin-layer chromatography could be used. TLC plates were prepared by spreading a slurry of 50 g of silica gel G in 100 ml distilled water and drying for 24 hr at constant temperature. Solutions of pesticides to be used were prepared in acetone and applied to the layer by micropipettes. Chromatograms were developed at a constant temperature with the solvent system of cyclohexane + chloroform (50:5). After development, the plates were air-dried, sprayed with 1% solution of diphenylamine in 95% ethanol, and visualized in UV light after 7-8 min exposures. R_f values obtained for methoxychlor, endosulfan A, endosulfan B, *p,p'*-DDT, aldrin, dieldrin, lindane, and endrin are listed for individual compounds and for the compounds as part of the mixture.

81-2372. Krivdin, L. B.; Kogon, V. Yu.; Sakharovskii, V. G. (Inst. Biochem. & Physiol. Microorganisms, Pushchino, USSR) **Dinamicheskaya struktura ordrama i odnogo iz produktov ego mikrobiologicheskoi transformatsii. [On the dynamic structure of ordram and one of its microbiological transformation products.]** *Izv. Akad. Nauk Kaz. SSS Ser. Biol.* (2): 310-313; 1981 (10 references) (Russian).

To evaluate the lack of complete degradation of the herbicide Ordram (molinate) by soil microorganisms, the structures of Ordram and one of the products of its microbial transformation (γ-hydroxyordram) were determined. Analysis by nuclear magnetic resonance spectra indicated there was a very high stability of the C-N bond in Ordram and its metabolite. Bond energy requirements of 15.7 ± 0.4 kcal/mol and 17 ± 1 kcal/mol for Ordram and γ-hydroxyordram, respectively, for C-N bond rotation were related to the degree of degradation by soil microorganisms.

81-2373. Ercegovich, C. D.; Vallejo, R. P.; Gettig, R. R.; Woods, L.; Bogus, E. R.; Mumma, R. O.* (Pestic. Res. Lab., Dep. Entomol., Pennsylvania State Univ., University Park, PA 16802) **Development of a radioimmunoassay for parathion.** *J. Agric. Food Chem.* 29(3): 559-563; 1981 (13 references).

Established methods in residue analysis of pesticides require extensive sample cleanup prior to quantification on relatively complex equipment. Radioimmunoassay (RIA) provides a simpler procedure with theoretically higher sensitivity and specificity necessitating only a minimum of sample cleanup. Parathion-specific antibodies were developed in rabbits by using a bovine serum albumin (BSA) conjugate wherein the reduced form of the pesticide was multiply bound to the protein via diazo bonds. An RIA method was developed by using either ^{3}H- or ^{14}C-labeled parathion as a tracer. The lower limit of detection was 4 ng of parathion in sample-free solutions and ~ 10-20 ng in blood plasma and lettuce without any cleanup of the sample extract; this corresponds to 0.1 ppm of parathion. (Author abstract by permission)

81-2374. Sane, R. T.; Kamat, S. S. (Dep. Chem., Ramnarain Ruia Coll., Matunga, Bombay 400019, India) **A simple colorimetric method for the determination of endrin in emulsifiable concentrates.** *J. Agric. Food Chem.* 29(3): 614-615; 1981 (18 references).

A simple colorimetric method for the determination of endrin from emulsifiable concentrates is described. The method is based on the reaction of formaldehyde-sulfuric acid with endrin in the presence of sodium perborate. The method is sensitive and obeys Beer's law for the concentration range 4-40 μg/ml with 99 ± 2% recovery. (Author abstract reprinted by permission of the American Chemical Society)

81-2375. West, S. D. (Agric. Anal. Chem., Lilly Res. Lab., Eli Lilly & Co., Greenfield, IN 46140) **High-pressure liquid chromatographic determination of the herbicide fluridone in cottonseed.** *J. Agric. Food Chem.* 29(3): 624-625; 1981 (3 references).

A method is described for determining fluridone [1-methyl-3-phenyl- 5-[3-(trifluoromethyl) phenyl]-4-(1*H*)-pyridinone] in cottonseed at levels as low as 0.05 ppm. Fluridone is extracted from cottonseed with methanol. Purification of the sample extracts is accomplished by aqueous-hexane and aqueous-dichloromethane partitioning, followed by alumina column chromatography. The purified extracts are concentrated and then measured by reverse-phase high-pressure liquid chromatography on μBondapak C_{18} by utilizing methanol + water (65:35) as the mobile phase. Detection is accomplished with a fixed-wavelength UV detection at 254 nm. Recoveries averaged 84.3% for untreated cottonseed fortified with 0.05-0.20 ppm of fluridone. The method is

evaluated by analyzing cottonseed samples from fields treated at rates of 0.3 and 0.8 lb/acre (0.339 and 0.904 kg/ha) fluridone 335 days after a preplant soil incorporation of the herbicide. (Author abstract reprinted by permission of the American Chemical Society)

81-2376. Gaynor, J. D.; MacTavish, D. C. (Res. Stn., Agric. Canada, Harrow, Ontario N0R 1G0, Canada) **Pentafluorobenzyl, (trifluoromethyl) benzyl, and diazomethane alkylation of bentazon for residue determination in soil by gas chromatography.** *J. Agric. Food Chem.* 29(3): 626-629; 1981 (11 references).

The reaction of bentazon [3-isopropyl-1*H*-2,1,3-benzothiadiazin-4(3*H*)-one 2,2-dioxide] with three alkylating agents was studied. Bentazon was rapidly and quantitatively methylated with diazomethane but interfering coextractives obviated its use for residue analysis in soil. Extractive alkylation of bentazon was quantitative in pentafluorobenzyl bromide or *m*-(trifluoromethyl) benzyl chloride when 0.1 *M* tetrabutylammonium hydrogen sulfate was used as the counterion in 0.2 *M* Na_2CO_3. The pentafluorobenzyl derivative showed 14-fold greater sensitivity to an electron capture detector compared to the methyl derivative while [*m*-(trifluoromethyl) benzyl]bentazon was 3 times more sensitive. The response of the (pentafluorobenzyl)bentazon to the electron capture detector was linear from 0.01 to 6 ng. The preferred alkylating agent was pentafluorobenzyl bromide since derivatized bentazon permitted direct analysis of soil extracts by gas chromatography. All three derivatives were stable in hexane for at least 1 wk. (Author abstract reprinted by permission of the American Chemical Society)

81-2377. Gorder, G. W.; Dahm, P. A.* (Dep. Entomol., Iowa State Univ., Ames, IA 50011) **Analysis of carbofuran and atrazine in soil samples.** *J. Agric. Food Chem.* 29(3): 629-634; 1981 (10 references).

A very rapid procedure for extracting carbofuran and atrazine from soil is described. Both pesticides were extracted from soil with ethyl acetate following soil-moisture adjustment. Minimal or no effects were caused by soil type, pH, and pesticide concentration. When compared with other carbofuran and atrazine extraction techniques, the ethyl acetate technique was equally effective, less time consuming, and permitted extraction of larger soil samples. Extraction of whole samples was preferred over subsampling for carbofuran analyses, because of very uneven distribution of that chemical in soil samples. Carbofuran and atrazine in extracts were measured without extract concentration or cleanup, by a gas-liquid chromatograph (GLC) with a thermionic specific detector. This technique was corroborated by high-pressure liquid chromatography. Atrazine, carbofuran, and several of their metabolites were separated by GLC with an Apiezon N liquid phase. It was the only one of nine liquid phases tested that adequately separated those compounds. (Author abstract reprinted by permission of the American Chemical Society)

81-2378. Skelly, N. E.; Jackson, D. J.; Anderson, P. K. (Dow Chem. Co., Midland, MI 48640) **High pressure liquid chromatographic analysis of chlorpyrifos-containing insecticidal formulations: collaborative study.** *J. Assoc. Off. Anal. Chem.* 64(3): 628-634; 1981 (7 references).

A high pressure liquid chromatographic method for determining chlorpyrifos was collaboratively studied. Three liquid and 2 solid formulations were analyzed by 12 collaborators. Samples were weighed and diluted with acetonitrile containing the internal standard, 1,4-dibromonaphthalene. Chlorpyriphos is separated on a Zorbax ODS column with acetonitrile + water + acetic acid (82 + 17.5 + 0.5) at 2 ml/min and monitored at 300 nm. Clay samples are extracted with the internal standard solution by agitation for 5 min. Coefficients of variation ranged from 1.28 to 2.40%. Results of all 12 collaborators fell within the 5% two-tail limits. The method has been adopted official first action. (Author abstract by permission)

81-2379. Williams, D. T.; LeBel, G. L.; Benoit, F. M. (Environ. Health Dir., Health & Welfare Canada, Ottawa, Ontario K1A OL2, Canada) **Identification of trialkyl and triaryl phosphates in distilled and Super-Q water.** *J. Assoc. Off. Anal. Chem.* 64(3): 635-640; 1981 (7 references).

An unidentified peak was noted during analysis of organophosphorus pesticides in drinking water. The unknown compound was detected in an extract from water purified through a Millipore Super-Q system has been identified as tributoxyethyl phosphate by gas chromatographic retention times and by gas chromatography (GC)/mass spectrometry. Purified water from distillation systems also contained trialkyl/aryl phosphate plasticizers/flame retardant additives: Tris(1,3-dichloropropyl) phosphate and triphenyl phosphate were formally identified and isopropylphenyl diphenyl phosphate was tentatively identified from mass spectra interpretation and from GC retention times on 2 chromatographic columns. (Author abstract by permission)

81-2380. Carson, L. J. (Div. Chem. Technol., US FDA, Washington, DC 20204) **Modified Storherr method for determination of organophosphorus pesticides in nonfatty food total diet composites.** *J. Assoc. Off. Anal. Chem.* 64(3): 714-719; 1981 (6 references).

A method for organophosphorus pesticide residues in nonfatty foods was modified to permit its use in analyzing the composites of nonfatty foods in the Food and Drug Administration Total Diet Program. Modifications were designed to permit the examination by gas-liquid chromatography (GLC) of the larger wt (100 mg) of sample

equivalent required by the Total Diet program. To achieve a limit of quantitation of 2 ppb parathion, the organophosphorus pesticides are determined by GLC equipped with flame photometric detector (P-mode) and/or KCl thermionic detector. Recovery data, ranging from 70 to 133%, are presented for fortification (2-10 ppb) of organophosphorus pesticides in 7 nonfatty food Total Diet composites. The modified Storherr method was successfully tested in an intra-laboratory method trial of 2 Total Diet composites (potatoes and legumes) fortified at 5-13 ppb with malathion, parathion, paraoxon, and monocrotophos. In addition, the modified Storherr method was compared to existing FDA Total Diet methodology for the determination of incurred organophosphorus residues. Residue levels found by both methods were similar for malathion (30 ppb), parathion (7 ppb), and diazinon (1 ppb), but only the modified Storherr method was capable of determining about 10 ppb dimethoate and phorate in the cereals and grains composite. (Author abstract by permission)

81-2381. Hopper, M. L. (Total Diet Res. Lab., FDA, Kansas City, MO 64106) **Gel permeation system for removal of fats during analysis of foods for residues of pesticides and herbicides.** *J. Assoc. Off. Anal. Chem.* 64(3): 720-723; 1981 (7 references).

A gel permeation chromatography system has been developed for the rapid cleanup of fatty foods in the analysis for pesticide residues. The narrow elution bands of fats and pesticides coupled with the ease of evaporating the eluting solvent makes this system efficient because of the savings in time and solvents. This system allows a wide range of compounds including organochlorine pesticides, organophosphorus pesticides, industrial chemicals, herbicides, carbamates, and drugs to elute in the cleaned-up fraction. (Author abstract by permission)

81-2382. Cochrane, W. P.; Lanouette, M. (Food Prod. & Insp. Branch, Lab. Serv. Div., Agric. Canada, Ottawa, Ontario K1A 0C5, Canada) **High pressure liquid chromatographic determination of aldicarb, aldicarb sulfoxide, and aldicarb sulfone in potatoes.** *J. Assoc. Off. Anal. Chem.* 64(3): 724-728; 1981 (18 references).

An ion-suppression reverse phase high pressure liquid chromatographic method is described for the determination of aldicarb, aldicarb sulfoxide, and aldicarb sulfone in potatoes. Samples are extracted with methylene chloride and Na_2SO_4, evaporated to dryness, and cleaned up using Sep-Pak silica and Sep-Pak-C_{18} cartridges. The extract can be successfully analyzed by high pressure liquid chromatography on either a μLiChrosorb RP-18 or μBondapak C_{18} column and quantitated using a variable wavelength ultraviolet detector set at either 220 or 247 nm. The mobile phase is acetonitrile-buffer (4 + 96) and (30 + 70), buffered to pH 7.6 and flowed at 2 ml/min. Recoveries ranged from 80 to 100%. The minimum detectable amount was 37.5 ng, which easily permitted the quantitation of 0.1 ppb aldicarb sulfone in 75 g sample. The recovery of aldicarb was low because of its rapid enzymatic oxidation to aldicarb sulfoxide and sulfone. (Author abstract by permission)

81-2383. Ambrus, A.; Lantos, J.; Visi, E.; Csatlos, I.; Sarvari, L. (Plant Prot. & Agrochem. Cent., Budapest POB 127 H-1502, Hungary) **General method for determination of pesticide residues in samples of plant origin, soil, and water. I. Extraction and cleanup.** *J. Assoc. Off. Anal. Chem.* 64(3): 733-742; 1981 (25 references).

Acetone extraction followed by partition into methylene chloride is used to extract organophosphate, organochlorine, carbamate, thiocarbamate, urea, triazine, and other types of pesticides. The efficiency of acetone extraction is demonstrated with different samples and compounds. A general extraction scheme is presented which is suitable for the determination of parent compounds and many of their metabolites. Different samples are divided into 8 groups according to the extraction process and cleanup on mixed adsorbent (active carbon, magnesia, diatomaceous earth), alumina, or silica gel columns. Maximum possible loads, depending on sample type and mode of detection, are given for each adsorbent. The method is suitable for 143 of the 257 pesticides used in Hungary. (Author abstract by permission)

81-2384. Ambrus, A.; Hargitai, E.; Karoly, G.; Fulop, A.; Lantos, J. (Plant Prot. & Agrochem. Cent., Budapest POB 127 H-1502, Hungary) **General method for determination of pesticide residues in samples of plant origin, soil, and water. II. Thin layer chromatographic determination.** *J. Assoc. Off. Anal. Chem.* 64(3): 743-748; 1981 (8 references).

o-Tolidine plus KI, *p*-nitrobenzene- diazonium-fluoroborate bioassay with fungi and enzyme sources, $AgNO_3$ plus UV radiation, and *p*-dimethyl-aminobenzaldehyde modes of detection have been selected for TLC screening of pesticide residues in extracts of samples of unknown origin. Single solvents were used for the elution. Coefficients of variation of R_f values were studied as a function of R_f and eluants. Indicator compounds were used for controlling the proper conditions of detection. The detectability of 188 pesticide compounds was tested, and the minimum detectable amounts were determined. (Author abstract by permission)

81-2385. Ambrus, A.; Visi, W.; Zakar, F.; Hasrgitai, E.; Szabo, L.; Papa, A. (Plant Prot. & Agrochem. Cent., H-1502 Budapest, Hungary) **General method for determination of pesticide residues in samples of plant origin,**

soil, and water. III. Gas chromatographic analysis and confirmation. *J. Assoc. Off. Anal. Chem.* 64(3): 749-768; 1981 (5 references).

Gas-liquid chromatography is widely used in pesticide residue analysis, and numerous packings of various polarity are recommended. GV-22, OV-101, NPGS, SE-30 (3% Gas-Chrom Q), and 1.95% SP-2401/1.5% SP-2250 on Supelcoport were selected as basic packings. Relative retention times for aldrin and methyl parathion were determined at 140, 160, 180, or 200°C and during temperature programming. OV-22 and OV-101 were most suitable for general purposes. A study on the performance of thermionic detectors suggested that their performance can be characterized and should be regularly controlled with test substances containing different hetero elements. Columns as short as 45-90 cm were suitable for screening purposes, and their advantages over traditional long columns are demonstrated. The fractionation of pesticides in an extract on silica gel columns was effective and practical for the confirmation of pesticides. (Author abstract by permission)

81-2386. Bulla, L. A., Jr.; Kramer, K. J.; Cox, D. J.; Jones, B. L.; Davidson, L. I.; Lockhart, G. L. (US Grain Market. Res. Lab., Agric. Res., SEA, USDA, Manhattan, KS 66506) **Purification and characterization of the entomocidal protoxin of *Bacillus thuringiensis*.** *J. Biol. Chem.* 256(6): 3000-3004; 1981 (26 references).

A procedure for purifying the protoxin as well as the toxin of *Bacillus thuringiensis* and some of the chemical and biological properties of each are presented. A functional protoxin in soluble form was generated through mild alkali titration. Contaminating cytoplasmic proteases were removed by anion-exchange chromatography. These contaminants were nonspecifically bound to whole native parasporal crystals. The apparent molecular wt for the protoxin was estimated to be 1.34×10^5 through polyacrylamide gel electrophoresis, gel filtration chromatography, and meniscus depletion sedimentation equilibrium analysis. Methionine was the only NH_2-terminal residue found. The soluble protoxin was 2.5 times more toxic to insect larvae than was the parasporal crystal. The protoxin slowly converted to a lower molecular wt toxin at alkaline pH. The protoxin and toxin had identical molar specific toxicities.

81-2387. Arakawa, Y.; Wada, O.; Yu, T. H.; Iwai, H. (Dep. Hyg. & Prev. Med., Fac. Med., Univ. Tokyo, Tokyo, Japan) **Rapid method for the determination of tetra-alkyltin compounds in various kinds of biological material by gas chromatography.** *J. Chromatogr.* 207(2): 237-244; 1981 (44 references).

A rapid gas chromatographic method is described for the simultaneous determination of tetra-alkyltin compounds in biological materials. Tetra-alkyltins were rapidly purified by direct passage through a silica gel column after extraction from the homogenized tissues with *n*-hexane. Gas chromatographic analysis was alternatively carried out with PEG 20M at temperatures from 50 to 150°C. A hydrogen flame-ionization detector was more sensitive and selective towards tetra-alkyltins than an electron-capture detector. Detection limits reached 1×10^{-8} g for tetra-alkyltins. Recoveries of tetra-alkyltins added to various tissues at the 85 nmol level ranged from 97 to 104%. *In vivo* studies indicated that for a sample containing more than 0.1 μg of tetra-alkyltins/g tissue, the proposed method is accurate enough for quantitative analysis. (Author abstract by permission)

81-2388. Grob, K., Jr. (Kantonales Labor, CH-8030 Zurich, Switzerland) **Evaluation of capillary gas chromatography for thermolabile phenylurea herbicides. Comparison of different columns including fused silica.** *J. Chromatogr.* 208(2): 217-229; 1981 (31 references).

The study reported was carried out first to define the possibilities and limitations of capillary gas chromatography (GC) for the analysis of phenylurea herbicides. Secondary, it was a useful means of studying the degradation of labile compounds on the column. Problems such as the detection of catalytic activity or the absence of a correlation of such activity with characteristics determined by known general testing procedures for assessing column quality are discussed. The analysis of intact phenylurea herbicides by capillary GC is possible for a restricted number of the more stable species. The compounds are degraded into the corresponding isocyanates upon thermal stress. Thin-film capillaries should be used to reduce the elution temperature as far as possible. Further improvement may be achieved by using hydrogen as the carrier gas to minimize retention. The capillary column may promote the decay by catalytic activity. Barium carbonate columns and a Chrompack column caused moderately high degradation rates, but considerably less than a Carbowax deactivated fused silica column. Persilanized columns were found to be the most suitable. An optimized sampling technique using vaporizing injection may cause relatively little degradation in the injector but, as this requires stream splitting, sensitivity is restricted. The precision and accuracy of this method are poor. Cold on-column sampling eliminates such problems. The pesticides studies were metobromuron, monolinuron, linuron, Maloran (chlorbromuron), fenuron, Cotoran (fluometuron), monuron, buturon, chlortoluron, diuron, neburon and metoxuron. (Author abstract by permission)

81-2389. Mayer, W. J.; Greenberg, M. S. (Dep. Chem., Kent State Univ., Kent, OH 44242) **Determination of some carbamate pesticides by high-performance liquid chromatography with electrochemical detection.** *J. Chromatogr.* 208(2): 295-304; 1981 (29 references).

An amperometric detector was used to determine some carbamate pesticides after a reversed-phase high-performance liquid chromatographic separation. Detection limits were determined which compared favorably with those obtained with other detectors. Dual detection, where the amperometric detector was in series with an ultraviolet detector, was employed to quantify pesticides that were not resolved on the chromatographic column. The pesticides studied were barban, Baygon (propoxur), benomyl, chloropropham, Landrin (2,3,5-trimethylphenyl methyl carbamate), Mesurol (methiocarb), propham and Sevin (carbaryl). (Author abstract by permission)

81-2390. Wallbank, B. E. (Biol. & Chem. Res. Inst., Rydalmere, New South Wales 2116, Australia) **Gas chromatographic determination of carbaryl residues on stored wheat by on-column transmethylation.** *J. Chromatogr.* 208(2): 305-311; 1981 (23 references).

A simple and rapid gas chromatographic method is described for the determination of carbaryl grain protectant residues down to 1 mg/kg on wheat during storage. Residues in acetone extracts are transmethylated on-column without extract concentration and are detected by a rubidium sulfate pellet alkali flame ionization detection. Lower limits can be achieved by concentrating. Co-extracted phosphorothionates present on the grain are also detected. (Author abstract by permission)

81-2391. Roseboom, H.; Berkhoff, C. J.; Wammes, J. I.; Wagman, R. C. C. (Unit Residue Anal., Natl. Inst. Public Health, NL-3720 Bilthoven, The Netherlands) **Reversed-phase ion-pair high-performance liquid chromatography of nitrophenols.** *J. Chromatogr.* 208(2): 331-337; 1981 (12 references).

The reversed-phase ion-pair high-performance liquid chromatography of nitrophenols (DNOC and dinoseb), using hexadecyltrimethylammonium as the pairing ion, is described. It is shown that with this system the parameters can be easily adjusted to give optimal chromatographic conditions. Another advantage of this technique is that it permits a specific detection of these compounds at longer wavelengths with a good sensitivity. At these wavelengths chromatograms of blank apple extracts are completely free of interferences. The efficiency of the extraction of the nitrophenols from water samples is satisfactory and concentrations of 1 μg/l can be easily detected. (Author abstract by permission)

81-2392. Nickless, G.; Pickard, J. A. (Dep. Inorg. Chem., Sch. Chem., Univ. Bristol, Bristol BS16 1GL, England) **Determination of triadimefon in grape juice and wine using capillary gas chromatography.** *J. Chromatogr.* 208(2): 409-413; 1981 (8 references).

A procedure is reported in which wine or grape juice is passed through a column of XAD-2 resin and the fungicide triadimefon is recovered by elution with methylene chloride. The eluate is concentrated and subjected to capillary GC with flame-ionization detection. Triadimefon had been sprayed on the vines as part of a spray trial for the control of powdery mildew conducted at Long Ashton Agricultural Research Station. The vines were sprayed to runoff 6 times with 0.0025% AI triadimefon and twice with 0.05% AI vinclozolin. The spraying dates for vinclozolin were 7/22 and 7/14, and for triadimefon were 73, 7/16, 8/1, 9/6, and 10/8. Samples of fruit were harvested on 10/16 and 10/29. The detection limit was 0.5 ng for triadimefon and for each of the triadimenol diastereomers. Vinclozolin was identified in the juice and wine extracts at residues 10-50 times that for triadimefon, and resulted from application earlier in the season for the control of *Botrytis cinerea* on the grapes. The phthalates found contaminating the juice and wine may have arisen during processing and storage.

81-2393. Kurhekar, M. P.; D'Souza, F. C.; Pundlik, M. D.; Meghal, S. K. (Reg. Forensic Sci. Lab., Nagpur 440012, India) **Identification of dieldrin derivatives.** *J. Chromatogr.* 209(1): 101-102; 1981 (10 references).

Derivatization of dieldrin was carried out on thin-layer chromatographic plates. The resulting residues were extracted with *n*-hexane and analyzed by gas chromatography. The two primary products of derivatization were positive for ketones, had R_f values of 0.39 and 0.61, melting points of 155 and 105, and retention times of 6.8 and 5.6. These two keto compounds underwent reduction with ZnCl-HCl to form dieldrin. It is therefore assumed that dieldrin, upon derivatization with ZnCl-HCl on thin layer plates, is converted to 2 dieldrin ketones.

81-2394. Perrigo, B. J.; Peel, H. W. (Sci. & Technol. Adv. Group, R. Can. Mount. Police, Ottawa, Ontario, Canada) **The use of retention indices and temperature-programmed gas chromatography in analytical toxicology.** *J. Chromatogr. Sci.* 19(5): 219-226; 1981 (19 references).

Retention indices from temperature-programmed gas chromatographs equipped with SE-30, OV-7, or OV-17 stationary phases are reported for 289 toxicological compounds. These retention indices are advantageous in comparing data from temperature programming and data from isothermal temperature systems reported in the literature. Improvement in precision of retention data using temperature-programmed systems is discussed. A comparison of the retention indices obtained by TP-GLC and the literature values for the isothermal technique for SE-30 and OV-17 was performed to test the reproducibility of the techniques involved. The differences in the SE-20 data were less than those in the OV-17 data. The differences in the linear part of either phase, SE-30 or OV-17, were

significantly less than in the initial or final portions of the program. The retention indices of some compounds were significantly different from those reported earlier.

81-2395. Boshoff, P. R. (Inst. Chromatogr., Dep. Chem., Univ. Pretoria, Pretoria, South Africa) **Control of relative retention in gas chromatography by temperature adjustment of series-coupled columns: the role of linear temperature programming.** *J. Chromatogr. Sci.* 19(5): 238-244; 1981 (6 references).

The process of linear temperature programming is applied to series coupled columns. Separations were obtained which otherwise were not possible for a given pair of stationary phases. The method was evaluated for possible use with pesticides. The pesticides examined included α_2BHC, γ-BHC (lindane), β-BHC, δ-BHC, dicofol, *p,p'*-DDE, α-endosulfan, dieldrin, *p,p'*-DDD (TDE), *p,p'*-DDT, β-endosulfan, phorate, diazinon, disulfoton, dimethoate, ronnel, fenitrothion, malathion, parathion, and bromophos. Through the use of linear temperature programming the SECAT-GC mode provided a significantly greater degree of control of relative retention than was possible with either mixed-phase columns or the SECAT-GC mode when operated at constant temperature.

81-2396. Ehrlich, B. J.; Hall, R. C.; Anderson, R. J.; Cox, H. G. (Tracor Austin Instr., Austin, TX 77821) **Sulfur detection in hydrocarbon matrices, a comparison of the flame photometric detector and the 700A Hall electrolytic conductivity detector.** *J. Chromatogr. Sci.* 19(5): 245-249; 1981 (15 references).

The comparative performance of the FPD and the Tracor 700A HECD for analyzing sulfur compounds in a matrix containing hydrocarbons was investigated. Parathion, methyl parathion, thimet, and H_2S were used as reference compounds. The two detectors had about the same sensitivity and specificity. However, the HECD had a wide linear response range and reduced response quenching with the presence of organic hydrocarbons. It also provided flexibility in operation, allowing for some peak confirmation by parameters adjustment. The FPD was simpler to operate, required less routine maintenance, and was better for quantitative use due to better accuracy of the linearized response within a small range and the uniformity of its response to various sulfur-containing compounds. The limit of detection for each detector was within 1 to 6×10^{-12} g sulfur/sec; the HECD was slightly more sensitive. Linearity of the HECD was at least 10^4 compared to 5×10^2 for the linearized FPD. It was concluded that the 700A electrolytic conductivity detector has some performance advantages over the traditional flame photometric detector as a sulfur-specific detector for gas chromatography.

81-2397. Spitzer, T.; Nickless, G. (Dep. Inorg. Chem., Sch. Chem., Univ. Bristol, Bristol BS8 1TS, England) **Trace analysis of fungicides in grape juice and wine using glass capillary gas chromatography.** *J. High Resolut. Chr. Chr. Com.* 4(4): 151-155; 1981 (11 references).

A method is described for analysis of the fungicides bupirimate, fenarimol, and vinclozolin in juices and wines produced from treated vines. Vines were sprayed 6 times with either 0.002% AI fenarimol, 0.03% AI bupirimate, or 0.05% AI vinclozolin and the fruit was harvested 8-21 days after final application. Juice and wine samples were filtered through XAD-2 resin after pH adjustment and were eluted with methylene chloride prior to glass capillary gas chromatography with a SE-30 stationary phase. The major proportions of the fungicides remained in the pressed fruits. At harvest, 8 days after final spraying, bupirimate residues were 0.15 mg/l in juice and 0.26 mg/l in wine; fenarimol levels were 0.07 mg/l in juice and 0.02 mg/l in wine; and vinclozolin levels were 0.60 mg/l in juice and 0.50 mg/l in wine. When fruits were harvested 21 days after spraying, residues were considerably lower, ranging from 0.005 to 0.17 mg/l in juice and from 0.01 to 0.16 mg/l in wine. Recoveries were 80-100% for bupirimate and fenarimol, and 50-80% for vinclozolin.

81-2398. Trussell, A. R.; Monur, J. G.; Lieu, F. Y.; Leong, L. Y. C. (James M. Montgomery Environ. Res. Lab., Pasadena, CA 91101) **Simultaneous analysis of all five organic priority pollutant fractions.** *J. High Resolut. Chr. Chr. Com.* 4(4): 156-163; 1981 (5 references).

A technique for a single sample to be simultaneously analyzed for acrolein, acrylonitrile, volatile organics, base neutral extractables, acid extractables, and pesticides is described. A fused, silica, open tubular column coated with SE-54 liquid phase was utilized. Following the injection of the extractable organics, a cryogenic focus was applied at the front of the column and the volatile fraction was desorbed. Combined gas chromatography and mass spectroscopy utilized in the analysis of water samples was successful in obtaining detection limits of < 1 μg/l.

81-2399. Simonaitis, R. A.; Zehner, J. M.; Redlinger, L. M. (Stored Prod. Insects Res. & Dev. Lab., Agric. Res., SEA, USDA, Savannah, GA 31403) **Simultaneous gas chromatographic determination of pirimiphos-methyl and malathion residues in peanuts, peanut hulls, peanut meats, and peanut oil.** *J. High Resolut. Chr. Chr. Com.* 4(4): 169-172; 1981 (7 references).

A gas chromatographic method is described for the simultaneous determination of malathion and pirimiphos-methyl in peanuts and peanut products. A gas chromatograph equipped with a flame photometric detector was used, and the gas chromatographic conditions are stated. Mean recoveries from fortified whole peanuts ranged from 85 to 105% for pirimiphos-methyl and from 78.3 to 109% for malathion. The limit of detection was 0.04 ppm. In a test of the efficiency of various solvents, low

recoveries were found with hexane, pentane, benzene, or 4:1 acetone:hexane. Recoveries of 90% were obtained when a dimethyl sulfoxide:pentane partitioning solvent system was used.

81-2400. Skrdlik, M.; Marek, V. (Lab. Hyg., KUNZ-KHZ, Brno, Czechoslovakia) **Spektrofotometricke stanoveni tetramethylthiuramdisulfidu v prachu z ovzdusi moriren osiv. [Spectrophotometric determination of tetramethylthiuramdisulfide in the dust in atmosphere of seed curing shops.]** *Prac. Lek.* 33(3): 86-89; 1981 (26 references) (Czech).

A method is described for the determination of tetramethylthiuramdisulfide (TMTD; thiram) in the air of seed curing shops. It is a modification of a spectrophotometric method, and is based on the formation of a yellow to brown complex of TMTD with copper cations in chloroform solution. Determination is made at 440 nm. The complex was stable at a temperature range of 15-35°C. No interference from commonly encountered dust components occurred, but dimethyldithiocarbamine and ethylenebisdithiocarbamine acid salts did affect the determination. The method is capable of determining concentrations up to 20-fold lower than the maximum allowable concentration of TMTD (0.5 mg/m³ in USSR). The method can be applied to determination of TMTD in dust on a filter as well as in the respirable dust fraction. TMTD concentrations in the range of 0.5-15 mg/m³ were observed in the breathing zone of workers involved in bag filling of cured seeds.

☆U.S. GOVERNMENT PRINTING OFFICE: 1981-341-831/52

See also 81-2105, 81-2179, 81-2182, 81-2194, 81-2298 *and* 81-2336.

The Administrator of the U.S. Environmental Protection Agency has determined that the publication of this periodical is necessary in the transaction of public business required by law of this Agency. Use of funds for printing this periodical approved by the Director of the Office of Management and Budget February 6, 1973.

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